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VASCULAR AND NEUROLOGIC LESIONS IN SURVIVORS OF SHIPWRECK*

II. Painful Swollen Feet Secondary to Prolonged Dehydration and Malnutrition

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THE true immersion-foot syndrome described in the first part of this paper[1] is caused by direct thermal injury to the tissues short of actual freezing. It develops after relatively brief periods of contact with water at temperatures below 50 or possibly even 60°F. A superficially similar, but fundamentally quite different, condition has developed after exposure to warm water and bright sunshine in survivors of torpedoed vessels who have been adrift in the Gulf Stream without an adequate supply of water and food for periods of over two weeks. These individuals may show no evidence of direct cutaneous injury, but yet complain of an equal degree of edema and sensory disturbance. This condition has also been called "immersion foot," but the term is inappropriate in this connection and should be given up.

The cases on which this report is based were seen in a United States Marine Hospital, through the courtesy of Captain W. S. Bean, the commanding officer, a member of the United States Public Health Service. He and his staff have permitted me to add the results of their clinical findings to my own, as well as to make use of their laboratory determinations. The deductions drawn from these data are my own and do not necessarily represent the views of the United States Public Health Service. These survivors of two lifeboat crews have already been the subject of a more detailed report for the Medical Corps of the United States Navy,[2] which will be briefly summarized here in order to point out that there are two fundamentally different conditions that may lead to much pain and incapacity following the sinking of ships at sea in the present war. Since the more complete report was written, new clinical and laboratory data have been furnished me by Drs. Richard H. Smith and Leo Waitzkin of the United States Public Health Service. This has necessitated a number of minor changes in the evidence presented and in the conclusions to be drawn therefrom.

It should be emphasized at the outset that the syndrome reported here is different in many respects from that observed after immersion in cold water.[1] With these southern survivors, both vessels were torpedoed in relatively warm water (around 70°F.) in southern latitudes during the month of April. The men were adrift for sixteen and seventeen days respectively. Owing to the fact that their ships were torpedoed well off the usual trans-Atlantic shipping lanes and they could not hope for early rescue, their allowance of water was progressively reduced from 16 ounces to a bare 5 ounces a day. With the intense sunshine and heat by day, coupled with the hard work of bailing and handling the boats, both crews developed such severe dehydration that they were unable to swallow the concentrated solid ration of pemmican, hardtack and chocolate. After the first few days all that the men were able to swallow was a small amount of malted-milk powder dissolved in their half-cup of water. Three out of six West African Negroes in the crew of lifeboat A drank salt water and died. All the crew members of lifeboat B survived. The men in both boats were so crowded that they were forced to sit close together with their legs dependent and to sleep in this position. After a week adrift under these circumstances nearly all the men noticed that their feet were becoming greatly swollen and numb; in addition they began to have a peculiar tingling and aching sensation in the soles. Some noticed similar symptoms in their hands but of lesser degree. The swelling and sensory disturbances in the legs were distinctly less noticeable in the men who had been able to move about the most. A few who took turns as steersman were able to

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stretch their legs out horizontally during their watches; others realized that the circulation in their feet was improved and the swelling was lessened by flexing and extending their feet and toes. A number of the men in lifeboat B who went over the side on several occasions to swim alongside commented on the improvement in the condition of their lower extremities. On finally being rescued, all were deeply tanned, and many had developed cracks and small crusted lesions due to exposure to wind and salt water. When they came aboard the rescuing vessels most of the men found that walking on their swollen feet was difficult, and that without support they lost their balance because of numbness in their feet and loss of sense of position. In addition the majority complained of deep plantar tenderness and pain. These exact complaints are also common in sailors rescued after immersion in cold water.[1] On their arrival at the hospital, all the men were suffering from exhaustion, malnutrition and dehydration.

The crew of lifeboat A had wet feet throughout the entire voyage, as their boat leaked continuously. During the last two days, when they sailed out of the warm water of the Gulf Stream and approached the coast, the temperature of the sea water fell to around 50°F. (below the critical level at which thermal injury can occur). As a result of this exposure several of the men, notably the West African Negroes (Cases 6, 7 and 8), ran a low-grade fever (99 to 101°F.) for several weeks* after rescue and developed changes in their feet characteristic of exposure to cold. These consisted of patches of superficial gangrene, blebs and sluggish circulation in the cutaneous capillary bed, with a subsequent hyperemic phase after rescue. This condition, however, was pronounced only in the Negroes and was much milder than that generally seen after exposure in northern waters.[1] The crew of lifeboat B were exposed to cool air and suffered from cloudy, heavy weather the first five days, so that their clothes were continuously wet. The weather then cleared and by day "the heat became almost unbearable. . . . Relief was obtained by going overside and swimming. Feet were also soaked in buckets of water. . . . Feet were kept dry except when soaked in buckets during heat of day." The crew of this lifeboat were therefore never exposed to water below 70°F. and showed no signs of cutaneous injury from cold.

After examining these men it was at once apparent that their condition differed fundamentally from that of the survivors seen after rescue from the colder waters of the North Atlantic. Although both groups suffered from swollen and painful feet, many of these survivors of shipwreck in relatively warm water did not bear evidence of tissue damage in their feet, and they had other systemic disturbances of a very different nature. These consisted of slight but definite swelling and subjective sensory disturbances in the hands, as well as the more obvious changes in the feet; many of the men were also found to have glossitis and stomatitis, and additional gastrointestinal complaints. The clinical findings observed in the entire series are summarized in Table 1, and the laboratory determinations in Table 2.

As pointed out above, some direct tissue injury from cold undoubtedly occurred in the crew of lifeboat A during the last two days of their voyage, when they left the warm waters of the Gulf Stream. This was definitely not the case in the men of lifeboat B. But with them, and to a large extent with the men of lifeboat A as well, it is evident that other reasons must have accounted for the greater part of the swelling, which often extended to the knees,† as well as the tenderness and other sensory changes, which involved the feet and, in some cases, the hands as well. Other contributory factors which might account for these findings are the following:

(1) *Continued dependency of the legs.* Hypostatic edema is always a factor after a voyage in a crowded lifeboat of prolonged duration when there is no space to stretch the legs out horizontally and men are forced to sleep in a sitting position.

(2) *Hypoproteinemia.* As a result of extreme dehydration, these men had been unable to swallow any solid food after the first few days adrift. In addition, they were forced to row and bail, the energy for which had to be provided from their own tissues. As a result it is not surprising that many were found to have a serum protein below the critical level at which edema develops. The low albumin-globulin ratio in Cases 1 and 7 is of particular significance. From the experimental work of Jones, Eaton and White[3] on nutritional edema in animals, it is probable that the swelling in the legs of these men was far less marked during the period that they were adrift and critically dehydrated, and that it developed rapidly as they were able to restore their depleted tissue fluids. There was also a progressive fall in serum protein in the course of rehydration, which is well exemplified by the serial determinations made in Case 1.

(3) *Vitamin deficiency.* One is led to speculate whether the intense aching pain and deep plantar tenderness complained of by these survivors during the last week at sea and in the

*In the case of uncomplicated thermal injury to the feet from cold, the febrile reaction usually subsides within thirty-six hours.[1]

†The changes due to cold water generally involve only the feet and lower third of the legs.[2]

TABLE I. *Clinical Data on Southern Survivors.**

Case No.	Age	Extent of Edema	Cutaneous Changes	Reflexes: Knee Jerk	Reflexes: Ankle Jerk	Sensory Changes	Muscle Tenderness	Pain	Stomatitis	Day of Discharge	Comment
	yr.										
CREW OF LIFEBOAT A											
1	29	++	Superficial gangrene in toe 5 (R); superficial desquamation in toes 1, 3, 4 and 5 (L).	+	+	Hypesthesia and tingling in distal half of feet	+	0	+++		Patient had marked degree of malnutrition and diarrhea for a month preceding torpedoing. In lifeboat he cowered on floor boards without moving. His general condition was precarious at first; he was semistuporous and had diarrhea with occult blood. Thermal injury to the feet was definite.
2	26	+	0			0	0	0	0	29th	Patient exercised feet during period of dependency.
3	22	±	Several small areas of cornification and desquamation	++	+	Skin of feet and lower legs hypersensitive	0	0	+	31st	Patient exercised feet while in lifeboat, and evidence of thermal injury was not marked. Neuritis disappeared within a week, but he developed a severe stomatitis 3 days after rescue, with fever and leukocytosis. This disappeared within a week after treatment with vitamin B.
4	32	0 (formerly present)	0	+	+	Numbness at first when walking; hypesthesia wore off distally, disappearing in 3 weeks.	0	++	0	29th	Patient exercised feet while in lifeboat. Neuritis gone in a week.
5	35	+	0			Hypesthesia receded to toes in 3 weeks	0	0		29th	
6 Negro	23	++	Deep cracks and blebs in skin of soles, with eventual sloughing			Impossible to evaluate owing to language difficulties	+	+++	0		Pain developed in 5 days. On admission, a sterile inflammatory reaction, the characteristic response of tissues after immersion in cold water, was pronounced. Patient had fever to 101°F. for 9 days. Feet became painless after 7 weeks, without vitamin therapy.
7 Negro	57	+++	Desquamation and epidermophytosis; hands also swollen at first.	+	+	Pain and sensory changes in hands for 2 weeks; hypesthesia distal half of feet present after 3 weeks.	+	++	0		Patient's bare feet were in water most of the time. Pain started after 3 days. On rescue, edema extended to knees. Reactive hyperemia was marked. Patient had fever to 100.5°F. for 3 weeks. Edema subsided promptly with treatment in Pavaex boot, but pain persisted for over 7 weeks. Thermal injuries were definite and probably cause of neuritis. Vitamin therapy was ineffective.
8 Negro	39	+	0	+	+	Hypesthesia at first to ankles, receding to toes in 3 weeks	0	++			Edema extended to knees, with sterile inflammation of feet. Temperature rose to 100°F., lasting a fortnight. Burning pain in feet persisted for a month. No vitamin therapy given. Thermal injury was less marked than in Cases 6 and 7.
CREW OF LIFEBOAT B											
9	33	0	0			0	0	±	+++	14th	Patient exhausted and in poor general condition.
10	44	0	0			Hypesthesia of toes; subjective changes in hands.	+	++	0	14th	Patient exhausted but made good recovery.
11	50	R: ++ L: +	0			Hypesthesia and paresthesia; subjective changes in hands.	+	+	+	11th	Neuritis disappeared in 3 days.
12	35	0	Superficial crusted lesions due to sun and windburn			Sensation objectively normal but subjectively abnormal in hands as well as feet	+	+	+	11th	Sensory disturbances disappeared before discharge.
13	24	±	0			Sensation objectively normal but subjectively abnormal in hands as well as feet	+	+	+	11th	
14	32	0	0			Distal half of feet hypesthetic; hands to lesser degree.	+	+	0	11th	Neuritis disappeared in 3 days.
15	25	0	0			Subjectively both hands and feet feel abnormal	+	++	0	11th	Neuritis cleared quickly.

*Crew of lifeboat A examined 3 weeks after rescue; those of lifeboat B, 2 days after rescue.

hospital could be caused solely by edema secondary to dependency and hypoproteinemia. It appears most unlikely that this could have been the case, and it is not possible to explain hypesthesia and ataxia of the feet, and similar subjective disturbances of the hands, on this basis. This picture is more suggestive of a deficiency in the antineuritic factor in the vitamin B complex, such as is seen in alcoholic neuritis. Examination of the knee jerks in these subjects showed normal responses in the 4 patients tested. This is incompatible with the advanced type of neuritis due to long-standing avitaminosis, but in no way rules out the earlier stages, which might occur in such a relatively brief period.

TABLE 2. *Available Laboratory Data on Southern Survivors.**

CASE NO.	DATE	SPECIFIC GRAVITY OF URINE	BLOOD										OCCULT BLOOD IN FECES
			RED-CELL COUNT	HEMOGLOBIN	WHITE-CELL COUNT	TOTAL PROTEIN	ALBUMIN	GLOBULIN	UREA NITROGEN	CHLORIDE	ASCORBIC ACID	PROTHROMBIN TIME	
			$\times 10^6$	*gm.*	$\times 10^3$	*gm./100 cc.*	*gm./100 cc.*	*gm./100 cc.*	*mg./100 cc.*	*mg./100 cc.*	*mg./100 cc.*	*sec.*	
1	4/15/42	1.025	—	—	—	—	—	—	—	—	—	—	—
	4/16/42	—	4.00	15.3	12.3	5.4	3.5	1.9	24.0	—	—	—	+
	4/20/42	1.019	3.81	13.3	10.9	3.3	1.7	1.6	—	—	—	—	—
	4/27/42	1.018	—	—	—	4.8	2.8	2.0	—	—	—	—	—
	5/7/42	—	—	—	—	5.4	3.3	2.1	—	—	—	—	—
2	4/15/42	1.030	—	—	—	—	—	—	—	—	—	—	—
	4/17/42	—	5.58	13.7	8.7	—	—	—	—	—	—	—	—
3	4/15/42	1.018	—	—	—	—	—	—	—	—	—	—	—
	4/17/42	—	5.89	13.3	15.1	—	—	—	—	—	—	—	—
4	4/15/42	1.025	—	—	—	—	—	—	—	—	—	—	—
	4/17/42	—	4.63	16.4	5.4	—	—	—	—	—	—	—	—
5	4/15/42	1.025	—	—	—	—	—	—	—	—	—	—	—
	4/17/42	—	5.09	14.0	9.6	—	—	—	—	—	—	—	—
6	4/17/42	—	3.63	10.5	13.9	—	—	—	—	—	—	—	—
	4/24/42	—	4.35	11.0	8.3	—	—	—	—	—	—	—	—
7	4/15/42	1.025	—	—	—	—	—	—	—	—	—	—	—
	4/17/42	—	4.99	13.3	10.0	—	—	—	—	—	—	—	—
	4/18/42	—	—	—	—	5.1	2.4	2.7	13.3	770			
8	4/15/42	1.020	—	—	—	—	—	—	—	—	—	—	—
	4/17/42	—	4.06	12.9	6.9	—	—	—	—	—	—	—	—
9	5/8/42	—	—	—	—	6.0	—	—	—	410	1.98	27	0
10	5/8/42	1.012	4.68	12.4	15.6	—	—	—	—	390	1.82	25	—
	5/9/42	—	—	—	—	5.6	—	—	—	—	—	—	+
	5/13/42	—	5.05	12.1	6.9	—	—	—	—	—	—	—	0
11	5/8/42	1.023	—	—	—	—	—	—	—	—	—	—	—
	5/9/42	—	—	—	—	—	—	—	—	—	—	—	+
	5/14/42	—	—	—	—	—	—	—	—	—	—	—	0
12	5/8/42	1.014	—	—	—	—	—	—	—	—	—	—	+
13	5/8/42	1.023	—	—	—	—	—	—	—	—	—	—	0
14	5/8/42	1.025	—	—	—	—	—	—	—	—	—	—	+
15	5/8/42	1.029	—	—	—	—	—	—	—	—	—	—	+
16†	—	—	—	—	—	—	—	—	—	—	—	40	—

*The figures do not show the striking alterations in the blood and urine which go with severe dehydration, but it must be remembered that these men had already had up to twenty-four hours to restore their depleted body water reserves before any of the above determinations could be made. Other compensatory factors must also be taken into account. Although Cases 2 and 3 show a definite erythrocyte concentration, the anemia that goes with starvation would counterbalance this. All the serum protein levels are low, and would probably have gone lower, as was so in Case 1, if further estimations had been made after the water balance had returned to normal levels. Half the patients still had a urinary specific gravity of 1.025 or higher after nearly a day's unlimited access to water. The blood urea nitrogen level of 24 mg. in Case 1 is distinctly elevated and the figure of 13.3 mg. in Case 7 is not significant, as it was not obtained until three days after rescue. Loss of blood electrolytes was pronounced in Cases 9 and 10. This was presumably caused by excessive sweating with a low salt intake, whereas the patient in Case 7, who had drunk salt water, had a very high level. The ascorbic acid figures in Cases 9 and 10 are not reduced.

†This patient, not included in the study because he had just been operated on for gastric hemorrhage, had the highest prothrombin time observed.

Further clinical findings that suggest an avitaminosis were the oral lesions. Of the patients examined, Cases 1, 3, 9, 11, 12 and 13 reached the hospital with a nonspecific stomatitis. This consisted of superficial vesicles and ulcers of the

tongue, buccal mucosa, palate and pharynx. In Cases 1, 9 and 12 the sides of the tongue were smooth and reddened, and the patient in Case 13 had suffered from bleeding gums. It is also of interest to note that in 7 out of 9 patients where the feces were examined with the guaiac and benzidine reagents, the tests were at first positive for occult blood (Cases 1, 10, 11, 12, 14, 15 and 16). It is of further interest that in the 3 patients in whom the prothrombin times were determined, there was an increase beyond the normal period of 20 seconds to 40, 27 and 25 seconds, although there is some question concerning the accuracy of these figures. If the values are correct, they denote a definite deficiency in vitamin K, which reached a severe degree in Case 16. This man, who had a history of chronic indigestion, became severely exsanguinated from a bleeding gastric ulcer, which finally necessitated surgical intervention. Another survivor in the same hospital, who had been rescued after a long period adrift in warm water, also suffered exsanguinating gastric hemorrhages, from which he died. It is possible that this bleeding from the gastrointestinal tract, as well as the stomatitis, is related to nicotinic acid deficiency, since ulcerations may occur at any level in the gastrointestinal tract in the deficiency state. Further studies on the role of vitamin deficiency in shipwreck survivors are urgently needed before any definite conclusions can be drawn.

Heretofore, the signs of alcoholic neuritis and pellagra have not been known to occur in as brief a period as a fortnight. In fasting subjects who have been studied for longer periods, sensory changes in the extremities have not been recorded, but these observations have been made on inactive persons. The fact that thiamin, nicotinic acid and riboflavin play an active chemical role in the oxidation of glucose may explain their rapid depletion in these survivors. A depletion of the antineuritic and other components of the vitamin B complex is, therefore, a distinct possibility. It is also possible that the men who suffered the most were in a partially depleted state before their ships were torpedoed and their vitamin intake stopped. This was certainly true in Case 1, but I was unable to discover any evidence of this in the other men.

In order to obtain further information concerning the possibility that vitamin deficiencies arise in such a short period of time, I consulted two authorities on vitamin deficiency, Dr. John B. Youmans, associate professor of medicine at Vanderbilt University School of Medicine, and Dr. W. H. Sebrell, chief of the Division of Chemotherapy of the United States Public Health Service. Dr. Youmans wrote:

> Patients with nutritional edema very frequently develop pain and tenderness, and sometimes superficial inflammation (erythema), particularly when the onset is rather abrupt. . . . With a very restricted diet and with hard work, some deficiencies such as that due to vitamin B_1 are believed to develop evidence of the deficiency within a week or so. . . . The stomatitis and glossitis may well represent a combination of a deficiency of the vitamin B complex, including riboflavin plus dehydration. Dehydration is quite important as there is evidence that this precipitates the syndrome of pellagra.

Dr. Sebrell, who subsequently saw some of this group of patients, states that his "impression is that thiamin and nicotinic acid deficiencies are definite possibilities." When further similar cases can be located he is prepared to make special tests to give accurate information about the thiamin and nicotinic acid levels. Examination of the scleras by the slit-lamp for peripheral vascularization and of the lips and mouth by experts in riboflavin and nicotinic acid deficiency will answer this question with certainty.

Unlike the more severe thermal injuries suffered by the survivors of vessels torpedoed in the North Atlantic, where vascular thrombosis and sepsis may necessitate amputation, the peripheral lesions of the cases from southern waters were not serious and required over a fortnight's hospitalization in only 6 cases. Three of these were the West African Negroes who undoubtedly had complicating injuries from immersion in cold water and less evidence of a vitamin deficiency than their Anglo-Saxon crew mates. The possible increased sensitivity of the West African Negroes to cold and their greater resistance to dietary deficiency will be a point of interest for further investigation. In examining the northern survivors I had been impressed by the fact that the reaction caused by immersion in cold water rarely extended much above the ankles, whereas in these cases it rose nearly to the knees. The edema subsided promptly on bed rest, elevation of the legs and an adequate diet. The most incapacitating symptom was the neuritic pain in the feet. These persisted for nearly two months in the 3 Negroes, 2 of whom were not given special vitamin therapy. Whether due to specific action or merely coincidentally, the neuritic manifestations disappeared within a period of three to ten days in the other men after a high intake of vitamin B.

In evaluating these survivors of exposure, malnutrition and dehydration, it seems reasonable to conclude that the men of lifeboat A suffered injury from cold of slight but definite degree. This, however, falls far short of explaining the entire clinical picture that they presented. Although the crew members of lifeboat B were generally

chilled by the cloudy, heavy weather of the first five days, thereafter they suffered from intense heat and their feet remained dry except when they wet them for relief. Their most striking symptoms — edema to the knees, sensory disturbances, which in some cases involved the hands as well as the feet, stomatitis and ulceration of the gastrointestinal tract — must be accounted for on a basis other than immersion in cold water. These conditions made their appearance slowly, the first tingling and pain developing at the end of a week. The edema can be readily explained by the prolonged dependency and protein deficiency. Whether the sensory disturbances and ulceration of the mucous membranes of the digestive tract are wholly or merely in part due to vitamin deficiency must require final proof from future more complete studies. Opportunities for such studies are now frequently present, particularly in the war in the South Pacific.

In the matter of treatment, much can be accomplished prophylactically by furnishing a more suitable lifeboat ration for vessels on tropical voyages. One of the hard facts brought out by the present naval war is that dry, concentrated foods are worse than none at all when water is scarce. Although the problem of supplying a more satisfactory ration remains to be worked out, an adequate intake of the various components of the vitamin B complex can be supplied very simply and inexpensively by tablets of brewer's yeast.* The protective properties of fresh meat are well known, and whenever this can be obtained in the form of birds, fish or shellfish, the raw meat, blood, liver and other viscera can, with few exceptions,[4] be consumed with safety. It is of interest in this connection that Captain Bligh's company, in the famous voyage from Tofoa to Timor after they were cast adrift by the mutineers on the *Bounty*, did not develop any symptoms of neuritis after six weeks on starvation rations supplemented by small quantities of fish, mussels and eggs of sea birds.[5] Judging from the experience of Dixon, Pastula and Aldrich,[6] who navigated the South Pacific for thirty-four days in a small rubber raft, an adequate diet can be obtained in many parts of the tropical seas if the lifeboat or raft is equipped with a small-caliber shotgun of rustless steel and a hand line or two. Richards and Banigan,[4] the authors of a very practical manual on how to abandon ship, point out that a fish spear is more useful than a hook and line — "Your hook either will be taken by a large fish, which will snap your line, or a small fish, which will be devoured before you can draw it in."

The skin can be protected against salt-water blisters in the tropics and also against cold by greasing[1]; therefore a liberal supply of heavy oil should be included in all lifeboat stores. In intense sunshine the skin must also be protected by some form of clothing and, if possible, by rigging an awning over the boat. Any constricting clothing about the legs or tight shoes should be removed. In addition to greasing the feet, stretching the legs out horizontally and forcibly flexing and extending the toes are of great value in reducing edema and stiffness of the muscles. Weather and absence of sharks and barracuda permitting, getting into the water and paddling alongside the boat has been found extremely helpful by all the sailors who have tried it. This not only prevents loss of water by sweating, but the muscular movements in a horizontal position increase the flow of lymph and return a considerable quantity of edema fluid to the circulation.[7]

When survivors are picked up they should be lifted on board the rescuing vessel and carried below to prevent further damage to the skin of their insensitive, swollen feet. If there is injury to the skin from sun and salt-water burns, prevention of sepsis is important. This and the care of cold-water injuries have been described in the first part of this paper.[1] Further local treatment should include elevation of the swollen legs, Buerger's postural exercises and physiotherapy, if carried out in a hospital by an experienced person.

The most urgent need of these survivors at the time of rescue is the proper treatment of their dehydration and malnutrition. This treatment is carried out along standard lines and will not be discussed here. In addition to a high protein intake, such patients should be given a therapeutic test of vitamin B in large amounts, with daily intramuscular injections of thiamin chloride, 50 mg., and Lederle's vitamin B complex, 10 cc. (this contains thiamin, nicotinic acid and riboflavin). If the response is favorable, it will go far to establish the diagnosis of vitamin B deficiency. Once this point has been settled, a less expensive therapy consisting of brewer's yeast (which contains large amounts of all the vitamin B components) and a diet of green vegetables, carrots, butter and liver can be substituted.

Summary and Conclusions

The painful swelling of the feet observed in two lifeboat crews, adrift for prolonged periods in the Gulf Stream, had fundamental clinical and etiologic differences from the "immersion-foot" syn-

*More concentrated preparations are available that contain reasonable proportions of the various components in the vitamin B complex. Among these are Unicaps (Upjohn) and Vitamin B Complex Capsules (Lederle).

drome which so often develops in the survivors of vessels lost in the colder waters of the North Atlantic.

Both groups of men had edema of the feet due to prolonged dependency and immobility.

In the case of the men torpedoed in the North Atlantic, additional swelling and neuritic pain were caused by direct injury to the skin, cutaneous capillaries and nerves by immersion in cold water.

Immersion in warm water per se cannot account for either edema or pain in the legs and feet. Therefore the syndrome reported here should not be classified as immersion foot.

In most of the men who were adrift for long periods in southern latitudes, direct thermal injury can be excluded (at least in the crew of lifeboat B). Hypoproteinemia from starvation was an additional cause of swelling in these survivors. Edema of this type is not generally considered to be painful. It is postulated, but not proved, that the stomatitis, sensory disturbances in the hands and feet, and plantar tenderness that developed in these patients were caused by a deficiency of the antineuritic factor and other components in the vitamin B complex. Evidence is quoted to show that such a deficiency may occur at a greatly accelerated rate in the rapid tissue-oxidation reactions that take place in men who are forced to do hard physical work in a hot climate on a very inadequate fluid intake.

An added deficiency in vitamin K was suspected in 3 cases in which the prothrombin times were determined, and loss of blood in the stools was a common occurrence.

The possibility that a deficiency of vitamins B and K may develop as a complication of shipwreck in such a brief period as two and a half weeks has not heretofore been suggested.

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CLINICAL BIOTIN DEFICIENCY*

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BOSTON

THIS report was prompted by studies performed during the past year on a patient with a nutritional dermatitis that was thought to be due to "egg-white disease" or biotin deficiency. There have been no previous reports of its spontaneous occurrence in man or in other animals.

Interest in egg-white disease was aroused in 1927 when Boas[1] reported that rats fed on a diet the protein content of which was furnished chiefly by dried egg white exhibited loss of weight, scaly dermatitis, baldness and spastic gait and finally died. He found that if the egg white was previously boiled or if the wheat starch in the diet was substituted with potato starch, the syndrome did not develop.

Since this report appeared, much work has been done to explain these mysterious phenomena.[2, 3] The disease has been produced in chicks,[4, 5] rabbits, monkeys,[6] dogs[7] and human beings[8]; however, rats have been studied much more extensively than the other animals. The condition is usually induced by the administration of large quantities of uncooked egg white. It has been demonstrated that chicks on such a ration have a deficiency of biotin in their tissues despite the abundance of this vitamin in the diet.[5] The condition has been induced in chicks without the use of egg white, however, merely by giving a diet that is devoid of biotin.[9, 10]

Rats fed a ration that is well balanced except for a large proportion of egg white as the sole source of protein begin to lose weight after a period of three weeks, and then develop red, scaly patches at the corners of the mouth.[1] The coat becomes rough and sticky and the long hairs fall out. Meanwhile the red patches spread to other parts of the body, and the picture is that of a generalized exfoliative dermatitis. The loss of hair may be extensive. There is marked spasticity of the limbs and the back is arched. Death is preceded by a rapid loss of weight. Necropsy shows almost complete absence of fat and increased vascularization of the skin.

Histologic examination of the skin reveals acanthosis, marked hyperkeratosis, parakeratosis and

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intercellular and extracellular edema in the epidermis.[11] The blood vessels in the corium are increased in number and are dilated, but little cellular infiltration is present and there is no endovasculitis or perivascular infiltration. Slight edema is present, as well as dissociation of the connective-tissue fibers of the corium.

Through the work of many investigators, it has now been shown that this disease in rats is due to the existence in the egg white of a substance that binds the biotin in the diet, preventing its absorption.[3] The specific constituent responsible for this effect has now been concentrated and purified.[12, 13] It is a proteinlike substance called "avidin" (an abbreviation for avidalbumin, meaning "hungry albumin"). This concentrated preparation can replace raw egg white as the toxic factor necessary for the production of egg-white disease, but it must be given orally, since with parenteral administration it actually has a curative action.[14] The latter phenomenon is presumably due to the fact that concentrates of avidin consistently contain some biotin, which is liberated in vivo. The only source of avidin thus far known is egg white.

The avidin-biotin compound under the conditions of the intestinal medium is a stable one and is excreted in the feces as such,[15] but may be broken up by steaming or by acid hydrolysis. Avidin loses its toxic effect if the egg white is heated at 100°C. for three to thirty minutes.[2, 16]

Animals with egg-white disease recover rapidly when placed on a normal diet and when the ingestion of egg white is stopped. They also recover even when continued on the same diet provided that adequate quantities of vitamin H (biotin) are administered. The latter is from three to five times more effective when given parenterally than when given orally.[17]

The identification of vitamin H[18–20] (the curative factor of egg-white disease in rats) as biotin[21] (a growth factor for yeast) and as coenzyme R[22] (a growth and respiration factor for many strains of legume-nodule bacteria) has eliminated the necessity of animal assay for the estimation of biotin and has allowed substitution for it of a simpler and quicker microbiologic method. When yeast is used as the test organism,[23] the bioassay can be performed in less than twenty-four hours.

Although biotin is widely distributed in the various articles of diet, it is found in the greatest concentrations in liver, kidney, yeast, cow's milk and pancreas.[24–26] It is present in egg yolk in a high-molecular, undialyzable form, which is physiologically active in yeast-growth tests or in tests made on rats with egg-white disease.[27] A whole egg, however, contains a distinctly greater amount of avidin than can be neutralized by the biotin of the whole yolk.[27]

Biotin is insoluble in water in its natural state as it occurs in liver, kidney or yeast.[24] For the complete extraction of biotin, commonly present in bound form in foodstuffs and similar products, acid hydrolysis is, in general, the most suitable procedure.[23, 26, 28–30]

Biotin was first obtained in crystalline form in 1936 in Kögl's laboratory from egg yolk.[21] The empirical formula was reported in 1938.[3] Du Vigneaud and his collaborators[20, 31] have isolated biotin from the liver as the pure crystalline methyl ester, the physical and chemical properties of which are in close agreement with the empirical formula $C_{11}H_{18}O_3N_2S$. Their later studies[32, 33] led to the recognition of certain functional groups of biotin, permitting them to conclude that it is a carboxylic acid containing an N, N′ – substituted cyclic urea grouping and possessing sulfur in a thio-ether linkage.

Case Report

R. M. (No. 1042432), a 66-year-old retired Italian laborer, was admitted to the Boston City Hospital on October 8, 1941, complaining of a chill, fever and cough. The routine clinical analyses revealed that he had a urinary-tract infection, chronic bronchitis, emphysema, arteriosclerotic heart disease (with mild congestive failure), amputated penis and exfoliative dermatitis — the last being of particular interest so far as this paper is concerned. There was no history of medication or of exposure to chemical agents to account for the rash. His dietary history was, however, significant.

Since adolescence the patient had been extremely fond of raw eggs, putting one or two into each glass of wine that he took. For several decades he had drunk wine or whiskey almost every day. During the six years preceding admission he had drunk from 1 to 4 quarts of wine daily. In order to have a sufficient number of eggs for his drinks, he deserted his family and moved to the country so that he could maintain his own chicken farm. During this period of time he ate from two to six dozen raw eggs per week. He did not eat at any regular time. Sometimes he ate only one or two meals a day, and sometimes he drank nothing but wine and eggs for 1 or 2 days. His choice of foods was narrow and consisted chiefly of canned goods; rarely did he drink milk or eat liver (sources of biotin).

So long as he could remember, his skin had been quite red, but 5 years previously the redness increased and many scales were noted. A mild conjunctivitis had been present for several months. These changes persisted, and 3 months before admission there was an increase in their severity. There was not much fluctuation in the nature of the rash. There was never any itching, vesicles, bullas or evidence of skin infection; nor was there diarrhea, sore tongue, neuralgia, cheilosis, night blindness or hemorrhagic phenomena.

In March, 1941, the patient had a partial amputation of the penis because of a carcinoma. Owing to a recurrence of the neoplasm, a more radical amputation was

performed in September, 1941. On October 8, he had a chill and fever and was readmitted to the hospital.

On examining the skin, about half the total surface (chiefly the trunk) appeared normal, but the entire face, ears, shoulders, dorsum of forearms, hands and lower legs were fiery red and covered with many medium-sized scales. The involved areas were sharply demarcated from the normal skin. On the trunk the lesions were small and scantily scattered. There was no elevation of the skin, no raw surfaces and little if any edema. There was slight palpebral edema and moderate conjunctival injection, but no corneal vascularization. The tongue was grayish red, but there was no papillary atrophy.

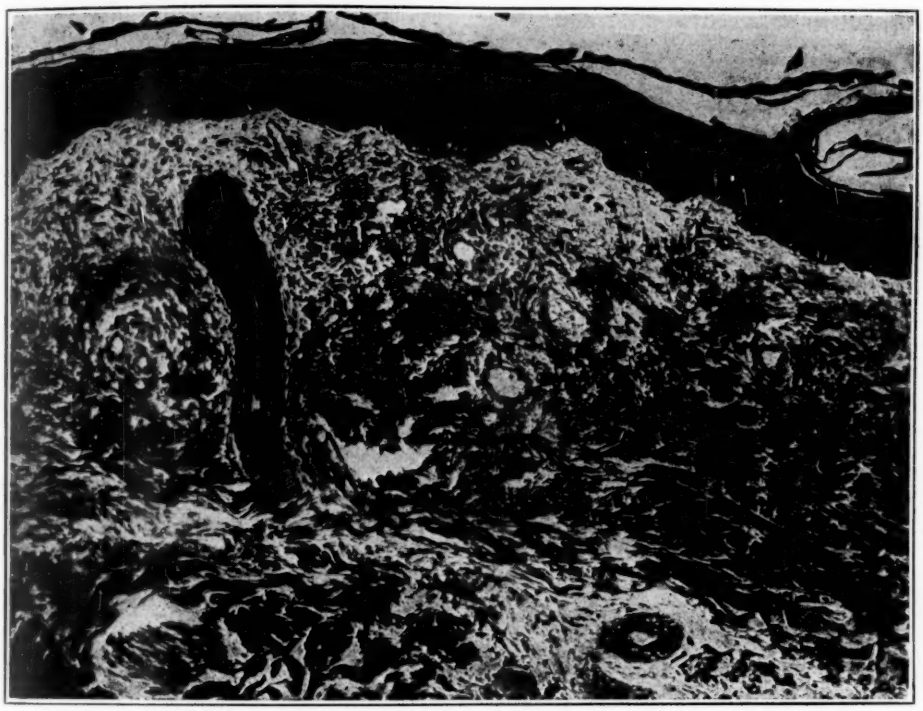

FIGURE 1. *Section of Skin.*

Note the loose sheet of keratinized epithelium, the absence of rete pegs and the cellular infiltration around the hair follicles, sweat glands and blood vessels.

The urine showed a + test for albumin, and the sediment contained many white cells, occasional red cells and no casts. Cultures of the urine repeatedly grew colon bacilli, enterococci, *Staphylococcus aureus* and occasionally *Proteus vulgaris*. The hemoglobin was 78 per cent. The white-cell count was 17,000, with 91 per cent polymorphonuclear leukocytes, 5 per cent lymphocytes and 4 per cent monocytes. A blood Hinton test was negative.

A biopsy of the skin was taken on October 10. The sections were studied by Drs. Frederic Parker, Jr., Howard T. Karsner, William R. Hill and several other pathologists. A specific diagnosis was not made, but a summary of the observations is as follows:

> There is a sharp distinction between the corium and epidermis (Fig. 1). The rete pegs are flattened and in some areas they do not extend downward into the corium, leaving a flat line between the two layers. Some of the hair follicles and sweat ducts are plugged. The epidermis is of normal width, but there is hyperkeratinization; masses of keratinized material are separated from the underlying epidermis and there is slight parakeratinization. Intracellular and extracellular edema in the stratum mucosum is present.
>
> The corium is thickened, owing to interstitial edema and hypertrophy of the collagen fibers. The fibers adjacent to the epidermis are homogeneous and pale; the middle and deep fibers are thickened, but otherwise normal. The sebaceous glands are absent, the hair follicles atrophic, the arrectores pilorum muscles hypertrophic, and the sweat glands and ducts dilated. A few acini of the sweat glands are necrotic. The elastic-tissue fibers are absent in the papillary bodies and decreased throughout the cutis, except in a band in the region of the superficial capillaries, where they are increased in number and the individual fibers hypertrophic. In the deep cutis they are hypertrophic but few in number. The subcutaneous fat and nerves are normal. In the upper corium are numerous areas of cellular infiltration, involving particularly the sweat glands and the blood vessels (Fig. 2). The cells are chiefly polymorphonuclear leukocytes and lymphocytes, with a few plasma cells. The vasculitis involves chiefly the superficial vessels, since the deeper vessels of the corium are normal. The vessels in the upper cutis are increased in number and show endothelial proliferation.

The significance of these histologic findings is discussed below; it is obvious that they are not those of pellagra.

A clinical diagnosis of possible biotin deficiency was entertained, but immediate attention was given to the urinary-tract infection. Nevertheless, in spite of intensive

treatment with sulfathiazole, sulfanilamide and sulfapyridine, it did not clear up during the period of observation.

On admission, the patient was placed on a regular hospital diet. Five days later this was supplemented daily with 600 cc. of wine and three raw eggs. The quantities of these were increased until, a week after admission, he was eating, in addition to the hospital diet, six raw eggs daily in a quart of wine. Nevertheless, the rash improved rapidly and by the end of 2 weeks there were only traces of it. Treatment of localized areas of the skin with ultraviolet and infrared light caused no exacerbation in the dermatitis.

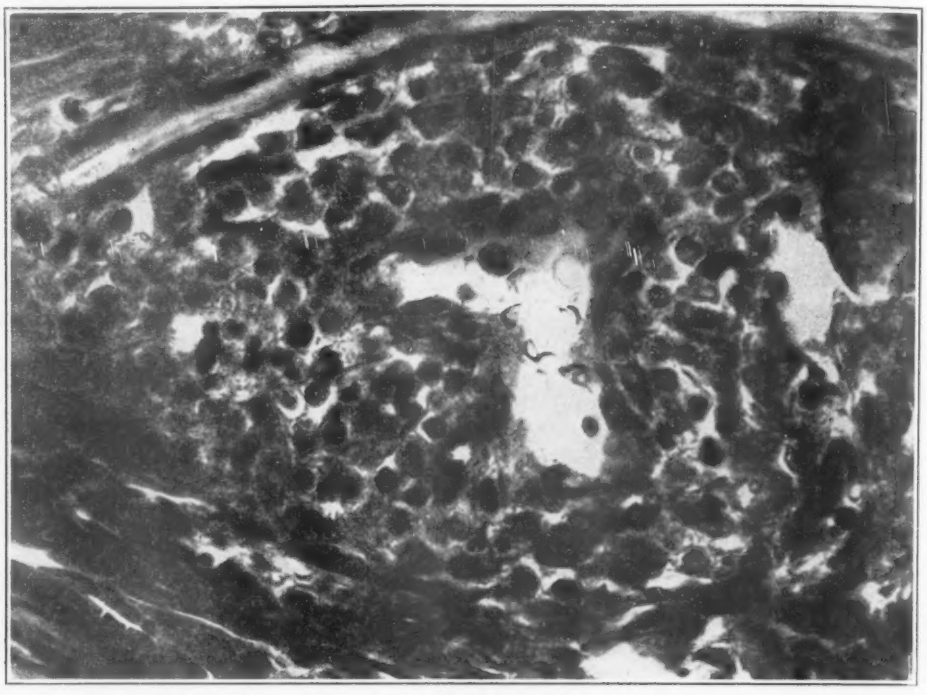

FIGURE 2. *Section of Skin.*
This shows the marked cellular reaction around the small blood vessels in the corium.

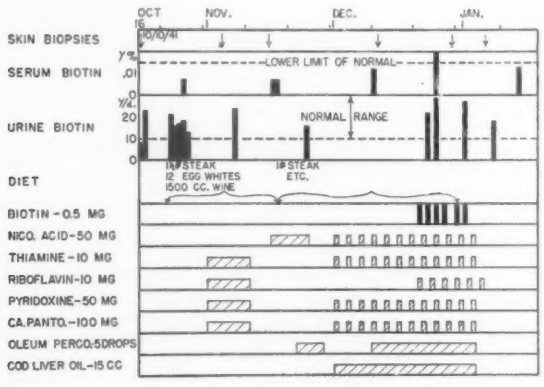

FIGURE 3. *Treatment Given the Patient and His Course in the Hospital.*

An attempt was then made to cause an exacerbation by limiting the biotin intake and giving a large quantity of avidin in raw egg whites. Therefore, on October 22 the patient was placed on a daily diet consisting of 1500 cc. of wine, the whites of twelve raw eggs, 1½ pounds of rare steak and coffee without cream or sugar. All the wine issued had been made by the patient and contained 0.55 gamma of biotin per 100 cc. Therefore the daily intake of biotin in the form of wine amounted to approximately 8 gamma. Assays of the beef muscle were not performed.* The whites of twelve eggs contain a sufficient quantity of avidin to bind approximately 230 gamma of biotin.[27] Therefore, it seems that little if any biotin would be absorbed from the gastrointestinal tract. On some days, indicated in Figure 3, the diet was supplemented with 10 mg. each of thiamin chloride and riboflavin,† 50 mg. each of nicotinic acid and pyridoxine,† 100 mg. of calcium pantothenate,† 5 drops of oleum percomorphum and 15 cc. of cod-liver oil. On November 16, the steak was reduced to 1 pound per day and the regimen continued until December 29, a total of 10 weeks. On December 20, the patient was given subcutaneously 0.5 mg. of the methyl ester of biotin.† This dose was repeated on alternate days until a total of six injections had been given. During the course of this treatment the biotin level of the serum was found to be normal for the first time. The amount of biotin excreted in the urine increased, but remained within normal limits.

*Rat muscle has been found to contain some biotin,[28, 30] although small in quantity as compared with that in liver and yeast. Beef muscle in daily doses up to 7.5 gm. has been found not to cure egg-white disease in rats.[24] Indeed, in some cases it seemed actually to accentuate the disease.

†I am indebted to the Winthrop Chemical Company, Incorporated, New York City, for the supply of riboflavin (Flavaxin Niphanoid); to Merck and Company, Incorporated, Rahway, New Jersey, for the supply of pyridoxine (Hexabione) and calcium pantothenate; and to the S. M. A. Corporation, Chagrin Falls, Ohio, for the supply of the methyl ester of biotin.

The second biopsy of the skin, obtained on November 4, showed marked regression of the inflammatory reaction. The subsequent four biopsies at scattered intervals during the next 2 months were essentially alike, showing to a slight degree hyperkeratosis, atrophy of the epidermis, increased pigmentation of the basal cells, edema of the corium, perivascular infiltration with lymphocytes, prominence of arrectores pilorum muscles and absence of sebaceous glands. During this time, however, there were slight or no gross abnormalities of the skin.

During the hospital stay there was a loss of 10 pounds in weight, due partially to improvement in the congestive heart failure. During this period of observation, one of the left inguinal nodes became enlarged and quite firm. This was apparently due to neoplastic extension. During the period of hospitalization the patient's general state of health appeared good and no new manifestations of vitamin deficiency developed.

Discussion

The presence of an exfoliative dermatitis of several years' duration in a patient with poor dietary habits and the absence of a history of exposure to toxic factors strongly suggest that the dermatitis was due to a nutritional deficiency. A deficiency in any one of the following five vitamins has been found to induce in animals the development of a scaly dermatitis: nicotinic acid, riboflavin, pantothenic acid, pyridoxin and biotin. Therefore, the clinical and histologic changes of these vitamin deficiencies must be considered in comparison with those listed in the patient above. It should be emphasized, however, that comparisons of changes in animals may not be applicable to human beings.

A nicotinic acid deficiency can readily be eliminated, since the dermatitis was more central than peripheral and the histologic changes were definitely not those of pellagra. Furthermore, there was no accentuation of the rash on treating the skin with large doses of ultraviolet light and there was no diarrhea, delirium, atrophy of the lingual papillae and so forth.

The skin changes of riboflavin deficiency, as described in rats, are milder than those observed in this case. They usually consist of small, whitish-yellow, dandruff-like flakes or scales; the formation of large scales and exfoliation is conspicuously absent.[34] Histologic studies show mild hyperkeratosis, only very slight exudation in the upper corium, a decrease in the follicles and increased activity of the sebaceous glands.[11] In this case there was a marked exudative reaction in the corium and disappearance of the sebaceous glands. Moreover, cheilosis and vascularization of the cornea were absent.[35]

The histologic manifestations of pantothenic acid and pyridoxin deficiencies in animals tend to overlap. With the former, there is a scaly dermatosis and alopecia without acrodynia.[3] There is also graying of the hair, hemorrhagic necrosis, serous exudate around the eyes, a twitch or paralysis of the hind legs and myelin degeneration of the sciatic nerves and spinal cord. Histologic changes of the skin in pantothenic acid deficiency have not been clearly distinguished from those due to pyridoxine deficiency.

Animals deficient in pyridoxine have a scaly dermatosis that is most marked around the nose, mouth and distal ends of the extremities.[36] Some areas of the skin remain normal. The formation of abscesses is common. On histologic examination one notes marked hyperkeratosis, acanthosis and intercellular edema of the epidermis.[11, 36, 37] The corium is also edematous and hyperemic and is diffusely infiltrated with lymphocytes, large mononuclear cells and, later in the disease, polymorphonuclear leukocytes. In the early stages the hair follicles and sebaceous glands remain intact, but in the late stages there is an infiltration of polymorphonuclear leukocytes into and around the hair follicles and sebaceous glands.

In animals with disease due to egg-white injury, there is acanthosis, parakeratosis, hyperkeratosis and intracellular and intercellular edema, without much cellular infiltration.[34]

The changes that were noted in the sections of the skin of this patient were not entirely like any of the above-mentioned vitamin deficiencies. The picture was somewhat like that of biotin deficiency, but in addition there was a marked cellular reaction. The latter suggests the possibility of a pyridoxine deficiency, either alone or combined with biotin deficiency. The clinical picture, however, was not similar to the acrodynia of rats.

Thus, in summary, one may state that the macroscopic and microscopic changes of the skin of the patient were compatible with the diagnosis of biotin deficiency, but not pathognomonic of the condition as seen in animals.

Assays of the serum revealed that the biotin content was below the normal level. The first urine specimen was also low, but all subsequent ones were within normal limits (Fig. 3).

The ward diet during the first two weeks of hospitalization was perhaps sufficient in biotin content to account for the almost total disappearance of the rash. In spite of the fact that the patient was then placed on a dietary regimen permitting little or no absorption of biotin from the gastrointestinal tract, there was no exacerbation of the rash and the urinary excretion of biotin remained normal. The biotin content of the serum, however, stayed below normal. It seems that this apparently paradoxical situation can best be attributed to the persistence of the urinary-tract infection. It has been shown that many bacteria can

synthesize biotin. The colon bacillus and *Staph. aureus* can produce it in large quantities,[38] and these organisms were repeatedly present in the urine of the patient, although he had been treated with various sulfonamides. It is probable that some of the biotin synthesized in the kidneys was absorbed by the vascular system and distributed throughout the body.

Large doses of various members of the vitamin B complex, including biotin, did not cause complete disappearance of all the histologic changes in the skin.

If this case is correctly interpreted as one of biotin deficiency, it is of interest that the patient developed a carcinoma of the penis with progressive growth while in a state of biotin deficiency, because du Vigneaud et al.[39] have found that rats rendered biotin-deficient rarely develop carcinomas when fed butter yellow. Biotin was, however, regarded by them as exerting a procarcinogenic effect when butter yellow was fed to rats receiving a highly protective diet.

Summary

A patient with an exfoliative dermatitis of several years' duration has been described. A long history of the ingestion of large quantities of raw eggs and of poor dietary regulation suggests that he had biotin deficiency.

Assays for biotin revealed that its content in the serum was persistently below normal, although it returned to normal on treatment with biotin. Most of the urine values were normal, possibly because of the persistence of a urinary-tract infection with biotin-producing organisms.

The dermatitis largely disappeared after the patient had been on a regular ward diet, without many raw eggs, for a period of two weeks.

Attempts to induce the reappearance of the dermatitis by the administration of a diet with large quantities of raw egg white and of low biotin content failed, possibly owing to the infection of the urinary tract.

The coexistence of a carcinoma is of interest in a patient with possible biotin deficiency.

I am indebted to Dr. Paul György, of the Babies' and Children's Hospital, Cleveland, Ohio, for his numerous helpful suggestions and the bioassays of the various specimens for biotin.

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MEDICAL PROGRESS

ENDOSCOPY*

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ENDOSCOPIC procedures are being used more and more frequently in all large clinics, where facilities for them are readily available. The clinician must know when to call on the specialist for the various endoscopies. It is hoped that the following review will help to indicate the trend of modern endoscopic thought and will assist the physician in deciding when the endoscopist should be called in consultation.

ANESTHESIA

In all the large endoscopic clinics local anesthesia is used almost entirely. In the clinic at the Massachusetts General Hospital 5 per cent Larocaine Hydrochloride or 2 per cent Pontocaine Hydrochloride has been substituted for cocaine, because although the latter may be somewhat more effective, it is probably more toxic than either Larocaine or Pontocaine. During the last few months it has been impossible to obtain Larocaine, and 2 per cent Pontocaine has been used entirely, without untoward results.

A reaction to Pontocaine, however, was reported by Phillips, Congleton and Tuttle.[1] Approximately 5 cc. of 0.5 and 1.0 per cent Pontocaine was used. Almost immediately there were fainting, twitching of the facial muscles and general tonic contractions, which were relieved by the intravenous administration of Dial. Other reactions to Pontocaine have been reported, but none to Larocaine.

BRONCHOSCOPY

Bronchiectasis. Blades and Graham[2] in a discussion of the surgical treatment of bilateral bronchiectasis mention that in some cases there has been difficulty in deciding from the appearance of lipiodol bronchograms which of the lungs was more extensively diseased. In these cases the impressions gained by bronchoscopic examinations were relied on to determine the major source of pus.

Diamond and Van Loon[3] studied 75 cases of bronchiectasis in children from the point of view of bronchoscopic aspiration, and concluded that most of the patients were subjectively improved by repeated bronchoscopies, but that in not a single case was there an anatomic cure.

Hemorrhage. In a study of 436 patients with hemoptysis, Jackson and Diamond[4] found the commonest causes to be bronchiectasis (138 cases), carcinoma (82 cases), tracheobronchitis (74 cases), pulmonary abscess (51 cases), no evidence of disease (34 cases), nonsuppurative pneumonitis (15 cases), suppurative pneumonitis (11 cases) and adenoma (11 cases). Other rare diagnoses made up the balance of the series. The high percentage of tracheobronchitis is worthy of note, for many physicians do not seem to recognize this condition as a cause of hemoptysis. In all these cases x-ray examination of the chest was negative. Nine patients had had one or more massive hemoptyses.

Parrish[5] reports 1 case of fatal hemoptysis in which bronchoscopy showed only a friable mucosa. This was confirmed by autopsy, which showed only erosions of the bronchial mucosa. This seems comparable to the cases of massive and even fatal hemorrhage from gastritis, and serves to emphasize the fact that serious hemorrhage does occur from badly inflamed mucous membranes with erosions but without actual ulcerations.

Asthma. Bases and Kurtin[6] emphasize the importance of bronchoscopic aspiration in status asthmaticus. They report that 6 of the 7 patients who died of status asthmaticus at the Mount Sinai Hospital in the past fifteen years and on whom autopsies were performed died from blocking of the tracheobronchial airway by excessive outpouring of secretion. In many cases death could have been averted by bronchoscopic removal of the obstructing secretion.

Postoperative bronchoscopy. Schmidt, Mousel and Harrington[7] stress the necessity of preventing atelectasis in the postoperative patient. In certain cases of bronchial obstruction they advise one or more bronchoscopic aspirations before operation to free the lung of as much of the infected secretion as possible.

Sealy and Priestley[8] report a case of total gastrectomy and cholecystectomy at the same time with very smooth convalescence. They attributed this result to an immediate postoperative bron-

Reprints of articles in this series are not available for distribution, but the articles will be published in book form. The current volume is *Medical Progress: Annual, Vol. III, 1942* (Springfield, Illinois: Charles C Thomas Company, 1942. $5.00).

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choscopy during which a considerable amount of bloody debris was aspirated from both sides of the tracheobronchial tree, and believe that had this material not been aspirated, a pulmonary infection would in all likelihood have developed which would have interfered materially with the patient's convalescence. At the Massachusetts General Hospital we consider this of such significance that we are training our anesthetists in the use of the bronchoscope for postoperative aspiration of secretions.

Bird[9] writes interestingly regarding the value of bronchoscopic aspiration immediately following operation. He reports that after the passage of an ordinary catheter through the endotracheal tube, one may still hear bizarre, coarse rales over various portions of the bronchial tree. If a bronchoscope is then introduced, exudate is always found, usually in small amounts, distributed irregularly along the sides of the trachea and large bronchi and in the orifices of some of the secondary bronchi. On removal of this bubbling fluid, on auscultation the lungs will be found entirely clear. Bird believes that removal of this residual, even though small, is essential, for if it remains it may cause localized bronchial infection and an exhausting, ineffective cough.

Carcinoma. Holleb and Angrist[10] report 2 cases of bronchogenic carcinoma associated with pulmonary asbestosis. Although these cases are of interest, it is impossible to prove a causal relation between the two conditions.

Prickman, Maytum and Moersch[11] observed 3 cases of primary bronchogenic carcinoma in asthmatic patients. Here again the significance of chronic irritation in the development of carcinoma is of interest but no causal relation can be proved.

Ochsner and DeBakey[12] have made a careful study of metastases from primary carcinoma of the lung, and conclude that in this disease there is a high incidence of metastases at the time the diagnosis is made, although fortunately some cases of bronchogenic carcinoma are characterized by late and limited metastases. The relative incidence of metastases to various organs and lymph nodes based on a collected series of 3047 cases is presented.

Goldman[13] made a special study of carcinoma of the lung of long duration. In a series of 11 selected cases, 10 of which were epidermoid, the duration from the time of onset of symptoms until diagnosis averaged ninety months. Goldman blames the delay in diagnosis on the inadequacy of bronchoscopy and roentgen examination to demonstrate early small peripheral tumors, particularly when complicated by empyema and abscess. He urges the education of both patient and physician "to produce in them an anaphylactic reaction" to the possibility of cancer in men over forty with symptoms of pulmonary disorder.

Adams, Steiner and Bloch[14] discuss what they call malignant adenoma of the lung, or carcinoma-like tumors of several years' duration. They report 5 cases of endobronchial tumor characterized by a long clinical course with low-grade but definite malignant manifestations. I believe that in general it is possible for pathologists to differentiate benign from malignant tumors. The term "bronchial adenoma" should denote a benign tumor, and as a tumor becomes invasive it should be called a carcinoma. "Malignant adenoma" seems to be somewhat of a contradiction in terms.

Clerf and Bucher[15] report 35 cases of adenoma of the bronchus in 243 consecutive cases of carcinoma, an incidence of 14 per cent. In one case an adenoma involved the trachea and both main bronchi. In another, an apparently benign adenoma was shown five years later to be a carcinoma; at post mortem there was a mass in the lung with metastatic carcinoma in the lymph glands of the mediastinum. When one considers the possibility of some adenomas' being relatively low-grade carcinoma, it is evident that lobectomy or pneumonectomy must be seriously considered, not only from the point of view of possible malignancy but also because, even in benign adenomas, there is frequently irreparable lung damage.

Tuberculosis. Brantigan, Hoffman and Proctor[16] point out that the increasing use of bronchoscopy for tuberculous patients has revealed a significant percentage of pulmonary lesions to be complicated by endobronchial lesions. They advise routine bronchoscopies before the performance of pneumolysis.

Durkin and Vinson[17] report the favorable outcome of a tuberculous bronchial stricture treated by high-voltage roentgen therapy. Since tracheobronchial tuberculosis may heal spontaneously, the value of x-ray therapy in this disease is easily exaggerated.

Phelps[18] emphasizes the poor prognosis in tracheobronchial tuberculosis, having found 31 per cent of a series of patients dead in five years, 63 per cent with chronic disease and only 6 per cent completely recovered. He finds the local application of 30 per cent silver nitrate helpful.

Alexander, Sommer and Ehler[19] are opposed to any form of collapse therapy for pulmonary tuberculosis when there are signs or symptoms of tracheobronchial tuberculosis until bronchoscopy has been performed to determine the type, position and extent of the bronchial lesions. After a long discussion, these authors conclude that there are certain clear-cut indications and contraindications

to both pneumonectomy and thoracoplasty in the treatment of pulmonary tuberculosis with bronchial stricture, atelectasis and fibrosis that must be strictly observed if a high percentage of therapeutic failures is to be avoided. In some cases neither pneumonectomy nor thoracoplasty can be used safely. For those cases in which no contraindication to either pneumonectomy or thoracoplasty exists, they believe that thoracoplasty is the better operation, because the mortality is much lower than with pneumonectomy and the percentage of apparent healing of the tuberculosis is much higher. Chamberlain and Gordon[20] consider the problem of endobronchial tuberculosis involving the large bronchi as essentially one of mechanical obstruction and its complications (emphysema, bronchiectasis, atelectasis and so forth). They also hold that early bronchoscopic recognition of the bronchial disease and reduction in the size of the pulmonary bed before chronic stenosis occurs are of fundamental importance in the therapeutic program; that pneumothorax is a dangerous form of therapy when the bronchial disease is severe and large bronchi are involved; that the local application of silver nitrate often aids therapy directed at the pulmonary lesion; and that severe endobronchial tuberculosis produces permanent damage to the bronchus and is accompanied by irreversible sequelae. A permanent form of therapy is therefore indicated. The results from thoracoplasty have been good. External drainage, lobectomy and pneumonectomy may be used in selected cases.

Thornton and Adams[21] in an article on the resection of lung tissue for pulmonary tuberculosis conclude as follows: The commonest complications have been persistent fistula, contralateral spread and empyema. The commonest indications for operation have been tuberculoma and isolated tuberculous lesions simulating tumor, tuberculous bronchiectasis, bronchial stenosis and post-thoracoplasty cavities. The best results were obtained in patients with closed lesions or with negative sputums. Resection of lung tissue in cases with bronchial stenosis is suggested only if secretions cannot be made to drain past the stricture. Rarely lobectomy or pneumonectomy may be performed in this type of case in the presence of a positive sputum; in general, however, resection of lung tissue is hazardous in the presence of a positive sputum. If possible, collapse therapy is preferred.

Benedict[22] in a symposium on bronchial obstruction discussed the problem of tracheobronchial tuberculosis. He emphasizes the fact that only by bronchoscopy can the differential diagnosis be established between this disease and other diseases causing bronchial obstruction, especially benign and malignant tumors.

From this review of the literature it is apparent that the medical profession is becoming increasingly aware of the importance of bronchoscopy in tuberculosis.

Esophagoscopy

Carcinoma. The most significant advance in surgery of the esophagus has been resection of lesions of the lower end by the transthoracic approach. Churchill and Sweet[23] have reported their experiences in this field and have described in detail the operative procedure whereby the tumor is resected and a direct anastomosis made between the esophagus and stomach. Esophagoscopy is essential for determining the nature and level of the lesion, and especially for procuring tissue for microscopic diagnosis. The results of operation compare favorably with those for resections for carcinoma in other locations of the stomach.

Carcinoma of the upper esophagus is notoriously difficult to treat, but Wookey[24] has described a method of surgical removal of such growths even when they involve the hypopharynx. Complete removal of the larynx and pharynx may be necessary, and in such cases it has been possible to reconstruct the pharynx and upper esophagus to permit the normal taking of food.

Benign tumors. Samson and Zelman[25] report that benign tumors are often asymptomatic and are encountered accidentally at autopsy. They are located predominantly in the upper fourth of the esophagus and include lipoma, myxoma and fibroma. In a series of 26 cases of grossly pedunculated tumors, 3 patients died suddenly because of regurgitation of the tumor into the larynx. After a thorough consideration of treatment by esophagotomy or esophagoscopy, it is the opinion of the authors that endoscopic removal is superior to extirpation by external esophagotomy.

Benign stricture. Certain cases of esophageal stricture have been found to be impenetrable. In such cases Drash and Woodward[26] recommend a surgical approach combined with the use of a bougie manipulated within the esophagus and manually from without.

Cardiospasm. Etzel[27] presents data which he believes tend to show that megaesophagus (cardiospasm), megacolon, achalasia of the pylorus, megaureter and disturbances in the cardiac conduction system are but varied manifestations of the same disease. A chronic or intermittent deficiency of vitamin B_1 is suggested as the etiologic agent of the degeneration in the autonomic nervous system, thereby instituting a series of physiopathologic

changes that culminate in the clinical picture described.

Samson and Foree[28] have reviewed the literature on the injection treatment of esophageal varices and report 1 case in which sclerosis was obtained by nine injections of 0.5 to 6.0 cc. of 2.5 per cent sodium morrhuate. They believe that the method has merit and deserves further trial. In their case many varices were present in the stomach.

Gastroscopy

Taylor[29] has described a new gastroscope the flexible part of which can be curled up or allowed to lie flaccid. It is flexible in all directions, but can be bent forward and backward in the plane of the objective up to the limits of optical flexibility. By reason of this controllable flexibility the new instrument possesses the following advantages: greater safety of instrumentation, less likelihood of failure of instrumentation, abolition of blind areas in the stomach, ability to move the instrument about in the stomach so as to inspect any particular area closely at will and from more than one angle and greatly increased illumination with less distortion of the image. In fact, endoscopic photography, which has previously been impossible with other flexible gastroscopes, has now become practicable.

Gastritis. Barnett[30] studied the symptoms of superficial gastritis and found no correlation between the symptoms and the severity of the gastritis as seen through the gastroscope. He found frequent gastroscopic evidence of transition from superficial to atrophic gastritis.

Benedict[31] in a series of 1300 cases examined by gastroscopy found hypertrophic gastritis without other gastric or duodenal disease in 117 cases (9 per cent). The commonest symptom was epigastric pain, which occurred in 74 per cent of the cases. It was relieved by food or soda in 81 per cent, related to meals in 52 per cent and present at night in 21 per cent. The similarity to ulcer pain is therefore striking. Other frequent symptoms were vomiting (45 per cent), hemorrhage (42 per cent), gas (41 per cent), sour eructations (16 per cent) and heartburn (15 per cent). Clinical improvement was in most cases definitely correlated with the improvement in the gastric mucosa as seen by gastroscopy. The expert roentgenologist using the relief technic may be helpful in suggesting a possible diagnosis of gastritis, but the only way of obtaining a positive diagnosis is by gastroscopy, and only by it can the differential diagnosis be made between the superficial, atrophic and hypertrophic forms. No method is wholly accurate in differentiating some severe cases of hypertrophic gastritis from those of carcinoma. In doubtful cases surgical exploration, including gastrotomy and biopsy, should be performed.

Olleros[32] points out that pernicious anemia is usually accompanied by atrophic gastritis, which may improve with liver therapy to a point where as observed through the gastroscope the lesion appears to be undergoing complete cure, although the improvement is never accompanied by histologic restoration. In tropical sprue Olleros found atrophic gastritis localized or generalized, but not so severe as that seen in pernicious anemia. After liver therapy the symptoms were checked and the gastroscopic characteristics ceased to predominate.

Einsel[33] reports a case of superficial ulcerative gastritis following tryparsamide therapy for syphilis. This patient had had heavy antisyphilitic treatment, which was followed by uncontrollable vomiting of several weeks' duration. Gastroscopy demonstrated hundreds of eroded areas, 2 to 4 mm. in diameter, with a pearly-white base and red edge. The mucosa was edematous and bled easily.

Judd[34] has carefully studied the residual lesions of ulcerative gastritis and their possible relation to the development of carcinoma of the stomach. In a review of the literature he emphasizes that cancer is always accompanied by gastritis (Faber[35]); that cancer never develops in a healthy stomach (Hurst[36]); that most carcinomas of the stomach probably arise on the basis of a chronic atrophic gastritis (Tuomikoski[37]); that gastric carcinoma may follow the atrophic type of gastritis (Schindler, Ortmayer and Renshaw[38]); and that the hyperplasia of the mucous glands may have some relation to the development of carcinoma (Robertson[39]). Judd made a microscopic study of surgically resected stomachs, and found a consistently lower incidence and markedly less prominent degree of hyperplasia in the control groups than in the cancer group, lending support to the conclusion that hyperplasia or regenerative activity is an important factor in the pathogenesis of carcinoma of the stomach. His final conclusions are that carcinoma develops in a previously damaged stomach; that many years of such injury may be required before neoplastic transformation begins; and that the pathogenesis of gastric carcinoma is directly related to the disorganized hyperplasia of gastric mucous cells.

Benedict and Mallory[40] made a careful study of 51 cases of surgically resected stomachs in an attempt to correlate the gastroscopic with the pathological findings in gastritis. The correlation was found to be more accurate than had been expected, and confirms the accuracy of the gastroscope in the diagnosis of gastritis and the differentiation of the various types of gastritis. Superficial gastritis as described by the gastroscopist cor-

responds to the acute exudative gastritis of the pathologist. The term "atrophic gastritis" is used by both gastroscopist and pathologist to denote the same type of mucosa. Hypertrophic gastritis as described gastroscopically corresponds to an exaggerated form of the physiologic plasma-cell and lymphocytic infiltration of the normal stomach. In this series there was complete or partial agreement between the gastroscopist and the pathologist in 88 per cent of the cases.

Gastric ulcer. Wolf and Wolff[41] studied the effect of emotions on the gastric mucosa of a patient with a gastric fistula, and found that intense sustained anxiety, hostility and resentment were accompanied by severe and prolonged engorgement, hypermotility and hypersecretion in the stomach. In this state mucosal erosions and hemorrhages were readily induced by even the most trifling traumas, and frequently bleeding points appeared spontaneously as a result of vigorous contractions of the stomach wall.

Carcinoma. Moersch and Weir[42] present a case of prolapse of the gastric mucosa in which the lesion was misinterpreted gastroscopically as being gastric carcinoma. They believe that repeated gastroscopic examinations obviate such errors, and that palpation of the abdomen during gastroscopy aids the gastroscopist in determining the pliability of the gastric wall and in bringing into view portions of it that might otherwise not be visualized.

Templeton and Boyer[43] have analyzed the gastroscopic and roentgenologic findings in the diagnosis of gastric cancer, and conclude as follows: In most cases a gastric cancer visible by one of the two methods of examination is demonstrable by the other, and will be diagnosed correctly by both the gastroscopist and the roentgenologist. Sometimes a lesion, by virtue of its location and morphology, is visible only to the gastroscopist or to the roentgenologist. Occasionally, lesions that are demonstrable by both methods are diagnosed as malignant by one examiner and as benign by the other, and when the facts finally become known it is found that the gastroscopist is no more and no less likely than the roentgenologist to be correct. Lastly, a combination of gastroscopy and roentgenology will result in a higher percentage of correct diagnoses than will either procedure alone.

Benign tumor. Cohn, White and Weyrauch[44] report an interesting case of granuloma of the stomach which followed the ingestion of medication containing colloidal kaolin (hydrated aluminum silicate). The patient had had abdominal pain, pyrosis, nausea and vomiting for eight years. Clinical and roentgenologic examination revealed no gastric disease. Gastroscopy showed a prepyloric tumor, which, however, was not seen in the grossly resected stomach. Microscopic study proved the lesion to be a granuloma with the type of foreign-body giant cell present in the lesions of silicosis. Mineralogic studies confirmed the presence of silica in the gastric tissues. Following resection the patient became asymptomatic and remained so for over two and a half years.

Schindler, Sandweiss and Mintz[45] state that it is possible to make a diagnosis by gastroscopy of a benign submucosal tumor by the stretching of a mucosal fold from the surrounding mucosa up to the surface of the tumor. The appearance of this type of tumor as seen by gastroscopy has also been illustrated by Benedict.[46]

Seasickness. Schwab[47] studied 38 cases of chronic seasickness in naval personnel and found that the patients fell into two groups: those constitutionally sick, with a history of car, bus and other sickness and with poor efficiency at sea; and those with severe seasickness, without the history of other sicknesses ashore and with a fair degree of efficiency at sea. Unfortunately, gastroscopy was carried out in only 2 cases.

Peritoneoscopy

Beling[48] believes that peritoneoscopy has not received the attention to which it is entitled. He thinks that if its indications and contraindications were better understood, the correct use of the peritoneoscope would bring about more accuracy in diagnosis and more correct treatment. He states that peritoneoscopy is indicated for the following conditions: noninflammatory disease of any of the organs within the greater sac of the peritoneal cavity, excluding the contents and border of the lesser sac, the pancreas, the kidneys and other retroperitoneal structures, with certain exceptions; a pancreatic growth, particularly one interfering with the continuity of the common bile duct, or one suspected of metastasis; a retroperitoneal mass (for determination of the location of an intra-abdominal mass with relation to the peritoneum); a suspected neoplasm or anomaly of any of the pelvic organs, including endometriosis; old chronic inflammatory disease of any of the pelvic organs; suspected ectopic pregnancy; splenomegaly or hepatomegaly; ascites not of cardiac origin; and tuberculous peritonitis. He particularly emphasizes the importance of peritoneoscopy in determining the presence or absence of liver metastases, primary carcinoma of the liver, hepatic cirrhosis, pelvic malignancy and ascites.

Donaldson, Sanderlin and Harrell[49] report a method of suspending the uterus without open abdominal incision by using the peritoneoscope and a special needle. This appears to be an ingenious idea, and the procedure is no doubt prac-

ticable in certain cases, but I am advised by gynecologists in this clinic that this type of suspension (Olshausen) is seldom used nowadays, and that therefore peritoneoscopic suspension would be infrequently indicated.

Hamilton[50] reports a new instrument consisting of a blunt-tipped rod with a "manipulator" and an insulated endothermy electrode, both of which fit into the sheath of a small paracentesis trocar through an airtight nipple. When needed, the trocar and sheath are introduced through a tiny separate stab wound under peritoneoscopic view, the trocar is removed, and the manipulating rod or electrode is inserted. The electrode is capable of dividing adhesions, opening benign cysts and so forth. With the rod, obstructions to peritoneoscopic vision are pushed aside or hidden structures are lifted into view. The author reports no accidents, and gratifying results.

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CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor*

CASE 29081

PRESENTATION OF CASE

A four-month-old girl was sent to the hospital because of fever, cough and extreme restlessness.

Three days prior to admission the patient developed a slight dry, hacking cough and seemed pale. She moaned all night, seemed feverish and became increasingly irritable. Her appetite was poor, but she took water well. At no time did she vomit. Bowel movements were normal. The child was treated at home with Argyrol nose drops and alcohol rubs.

The family history was negative. There was no evident exposure to contagion or illness of any kind. The child was delivered at term after a normal pregnancy. She was breast fed, and vitamin supplements were provided after three weeks of age. The child gained weight and seemed quite normal prior to the present illness.

Physical examination disclosed a well-developed and well-nourished but acutely ill child who was flushed but seemed well hydrated. Respirations were rapid and of a grunting type. There was no rash. The fontanelles were flat. Both eardrums were slightly congested, but the landmarks were normal. The nose was clean. The throat was slightly congested. Expansion of the chest was symmetrical. Over the entire lower part of the left lung the percussion note was impaired and bronchovesicular breathing was audible. Examination of the heart and abdomen was negative. The liver edge was palpable at the costal margin.

The temperature was 104°F.

Examination of the blood revealed a red-cell count of 4,200,000 with a hemoglobin of 105 per cent, and a white-cell count of 15,450 with 53 per cent polymorphonuclear leukocytes, 38 per cent lymphocytes and 9 per cent monocytes. A throat culture demonstrated a few beta-hemolytic streptococci.

An x-ray film of the chest showed an area of consolidation behind the heart in the left lower lobe. The left costophrenic angle was partially obliterated.

In spite of a course of sulfadiazine producing a blood level of 5.0 mg. per 100 cc. the child's temperature remained elevated, spiking daily to over 104°F. On the second day after admission the right eardrum was acutely inflamed and bulging and the landmarks were obliterated. One observer believed that the signs of consolidation had spread to the left upper lobe and possibly to the right upper lobe. Marked abdominal distention developed, and the child died on the fourth day after admission, the temperature finally rising to 106.1°F and the respirations to 60.

DIFFERENTIAL DIAGNOSIS

DR. RALPH A. ROSS: The history in this patient is one of a mild respiratory infection gradually progressing without apparent fluctuation. The remark about the moaning of the child is of some interest since babies who are sick often have a sighing type of respiration that might be called moaning.

The examination at the time of admission gave evidence of bilateral otitis media shown by congestion of both eardrums and also of some type of consolidation in the left lower lobe. The red-cell count was normal. One wonders whether the hemoglobin reading of 105 per cent was accurate. It is a striking degree of hyperchromatism in the red cells for an infant of four months; in the newborn period, of course, it is regularly seen. The leukocytosis is perfectly compatible with an acute infection in a child of this age. The relatively high percentage of monocytes does not point in any one direction.

The most important laboratory finding is the throat swab; even a few colonies of beta-hemolytic streptococcus in an infant of four months are of possible pathologic significance. However, it is generally understood that throat cultures are not indicative of the true etiologic agent in the lower respiratory tract; one should make a nasopharyngeal culture or one from material coughed up from the lower respiratory tract. To obtain the latter is a difficult procedure, which takes some degree of experience. The former can be easily carried out with the proper equipment. One wonders about blood cultures. There is no mention of them.

I should like to see the x-ray films.

DR. GEORGE W. HOLMES: The process spoken of in the chest is visible at this point, close to the angle of the diaphragm and the spine, and is more or less hidden by the shadow of the heart. There is also an area out toward the periphery that obscures the angle between the diaphragm and the chest wall, which may be a continuation of the same process. The diaphragm is not elevated. There is no evidence of decreased aeration in the lung. One would not seriously consider a plug-

ging of the bronchus, with a collapsed lung. It looks more like consolidation of some sort.

DR. ROSS: There is no evidence of fluid?

DR. HOLMES: No.

DR. ROSS: The clinical picture, together with the laboratory evidence, is one of a generalized respiratory infection involving the throat and ears and producing a localized pneumonic process. One is tempted to incriminate the hemolytic streptococcus as the etiologic agent, inasmuch as that organism was found in the throat. However, hemolytic streptococci may be found at the same time that other pathogenic organisms are present in the lower or upper respiratory tract and may not be the real cause of the difficulty. In this age group, under six months, pneumonia is still a serious problem. Before the advent of chemotherapy the fatality rates in this age group were as high as those at the other extreme of life. Some figures show up to 40 or 50 per cent mortality.

Thus we have a patient who was, by reason of her age, unable to handle the type of infection that we suppose was present. Lack of adequate response of the patient to infection often leads to the accumulation of purulent material, either because of infection of the serous cavities or because of a breaking down of the involved portion of the respiratory tract.

In the hospital course there was a steady progression downhill, with a spiking temperature and the probable spread of the pneumonia. The question of fluid in the pleural cavity comes to mind as the cause of spread of signs in the chest, but we have no further evidence of that. The appearance of otitis media of a purulent type indicates a progression of the process. One wonders whether we are justified in saying it was justifiable to state that the temperature remained elevated "in spite of a course of sulfadiazine producing a blood level of 5 mg. per 100 cc." Five milligrams is considered the lower limit of the effective level of sulfadiazine, and, particularly in this age group, a higher level should be aimed at. The development of distention in the last forty-eight hours of life may have been entirely on the basis of paralytic ileus, which is frequently seen in serious pneumonia. On the other hand it may have been due to the spread of the infection to the peritoneum.

The diagnoses are localized pneumonia, purulent otitis media on the right and a purulent intrathoracic complication — empyema or a breakdown of the involved lung into multiple abscesses. Peritonitis is a remote possibility.

DR. ALLAN M. BUTLER: Another point that this case brings to mind is the necessity today of trying to be specific in the bacterial diagnosis of a severe respiratory infection, whether it is tracheitis, bronchitis or pneumonia. One wonders if all of us at times have been a little too satisfied with just giving sulfonamide therapy in such cases without tracking down the specific etiologic agent. The reason it is important is that we have specific therapy for certain types of infection. For instance, with influenzal infection we have specific anti-influenzal rabbit serum that should be given in conjunction with chemotherapy. If Dr. Castleman should say in a moment that the cause of infection in this child was a staphylococcus and not a beta-hemolytic streptococcus, then, with penicillin available, the specific therapy should be a combination of penicillin and sulfadiazine. The search for the specific infectious agent should be pursued with just as much intensity now as it was prior to the days of sulfonamide therapy.

DR. BENJAMIN CASTLEMAN: How would you go about it?

DR. BUTLER: In this particular case, every effort should have been made to get nasopharyngeal cultures, which are better than throat cultures. With the spike in temperature, blood cultures should have been obtained. I imagine such efforts were made but were not successful.

DR. CASTLEMAN: A blood culture was taken but did not grow out by the time the patient died.

CLINICAL DIAGNOSES

Bronchopneumonia.
Bilateral otitis media.

DR. ROSS'S DIAGNOSES

Pneumonia, localized.
Otitis media, purulent, right.
Intrathoracic purulent complication (empyema or multiple abscesses).

ANATOMICAL DIAGNOSES

Pulmonary abscesses, multiple, left.
Empyema, left.
Bronchopneumonia, left.
Otitis media, acute, bilateral.

PATHOLOGICAL DISCUSSION

DR. CASTLEMAN: The autopsy on this child showed an empyema in the left pleural cavity, which was filled with thick creamy-yellow purulent material. The visceral pleura of that lung was studded with small abscesses 1 or 2 mm. in diameter. A cross section of the lung showed that the parenchyma itself was diffusely involved with abscesses 2 or 3 mm. in diameter. The intervening lung tissue was consolidated. The process probably began as a pneumonia and then rapidly broke down into small abscesses. A culture of the middle ears, both of which contained pus,

showed *Staphylococcus aureus*. I think therefore that we can be quite certain that the whole process was due to a staphylococcal infection, although the blood culture, even after a period of two weeks, showed no growth.

DR. CHARLES JANEWAY: Was there a culture from the empyema cavity?

DR. CASTLEMAN: One was taken but we could not find the report; I am sure that it was due to a staphylococcus. The fluid was thick and purulent, not the type one sees with a hemolytic streptococcus. There was no evidence of infection anywhere else, including the sinuses of the head.

DR. HOLMES: What was the date of death?

DR. CASTLEMAN: Four days after the films were taken.

DR. HOLMES: Do you think it would be possible for empyema to develop after these films were taken?

DR. CASTLEMAN: Yes. There probably was some pleurisy at the time the films were taken, but probably little if any fluid.

DR. JANEWAY: I should like to emphasize the fact that this was a staphylococcal case and that bacteriology of the respiratory tract should not be done in the conventional way, particularly when dealing with infants or children. Our tendency is to type a sputum for pneumococci and not even culture it. We are gradually getting away from that, but bacteriologists are prone to look at a plate only for hemolytic streptococcus and pneumococcus. If they do not see them they say that there are no important organisms. In the influenza epidemic two years ago, when staphylococcal pneumonia was a complication, we missed one or two cases until we became aware of the fact that on the blood plate made from the sputum the staphylococcus was by far the predominant organism. That is true in any severe infection of the respiratory tract in an adult when there is a virus infection or when there is trauma, such as occurs from the inhalation of smoke or poison gases, both of which pave the way for secondary bacterial invasion. In the infant, susceptibility is so great that no antecedent damage is necessary to enable the less pathogenic micro-organisms to invade the lungs.

CASE 29082

PRESENTATION OF CASE

A sixty-two-year-old blind housewife was sent to the hospital because of pain in the right foot.

Five years prior to admission the patient was said to have dropped a flatiron on her right foot. Three months before entry she noticed a constant dull nonradiating pain in the lateral aspect of the foot, which became progressively worse. Approximately a month later swelling developed over the dorsolateral aspect of this foot, particularly after standing.

Her husband and a daughter were living and well. Sixteen years before admission the patient was treated for a gonococcal ophthalmia that produced bilateral corneal opacities and blindness. She denied venereal disease. For several years the patient had suffered from a "loose cough," which was never productive of sputum. At no time had she had fever, chills, night sweats or hemoptysis.

Physical examination disclosed an obese woman in no distress who looked older than her stated years. Both corneas were opaque. Medium coarse rales were audible posteriorly at the bases of both lungs. Examination of the heart and abdomen was negative. There was a firm, tender swelling of the right foot in the region of the fifth metatarsal bone. The mass could not be moved, did not pulsate and seemed to be attached to the underlying structures. The skin over the involved area was not red or edematous.

The blood pressure was 160 systolic, 85 diastolic. The temperature was 98.6°F., pulse 71, and the respirations 24.

The examination of the blood revealed a red-cell count of 4,490,000 with a hemoglobin of 75 per cent, and a white-cell count of 9000, with 33 per cent polymorphonuclear leukocytes, 20 per cent large lymphocytes, 33 per cent small lymphocytes, 10 per cent monocytes, 2 per cent basophils, 1 per cent eosinophils and 1 per cent unclassified cells. There was a moderate achromia of the red cells, and the platelets were slightly reduced. The urine was acid in reaction, had a specific gravity of 1.014, and showed a ++ test for albumin; the sediment contained 7 red cells, 50 white cells and 4 epithelial cells per high-power field. The blood Hinton test was negative. The tuberculin test, employing a 1:1000 dilution of O.T., was markedly positive.

An x-ray film of the right foot was unusual. The medial two thirds of the shaft of the fifth metatarsal bone showed osteophyte formation and short spicules of calcification extending laterally and inferiorly. The bone was decalcified proximally. Close to the distal head in the medulla there was a dense area of calcification within a radiolucent area. The metatarsal bone was increased in size. There were calcification of the blood vessels and local soft-tissue swelling. A chest plate demonstrated calcified areas in the right upper lung just below the clavicle that were consistent with an old tuberculous lesion; there was no evidence of active disease. The lungs were otherwise clear. The heart was not remarkable.

Two days after admission a small fluctuant area developed on the lateral aspect of the right foot in the area of swelling. A small amount of serosanguineous fluid was aspirated, and this was negative for any specific organism, both on smear and culture.

An operation was performed on the eighth hospital day.

Differential Diagnosis

Dr. Richard H. Wallace: May I see the x-ray films?

Dr. Richard Schatzki: I should describe this as cystlike destruction in the proximal half of the fifth metatarsal. The cortex is broken through in places, and there is coarse new-bone formation, which is perpendicular to the direction of the bone. The rays of new bone are thicker than those that one usually sees in osteogenic sarcoma. There is also soft-tissue swelling, and a localized area of increased density in the distal portion of the involved metatarsal that looks like an osteochondroma.

Dr. Wallace: Is there a fracture in the bone?

Dr. Schatzki: No fracture is visible. There may well be one in that area, but the cortex is gone and no definite fracture is visible.

Dr. Wallace: The other bones are negative. Is there evidence of metastatic disease in the chest?

Dr. Schatzki: No.

Dr. Wallace: The x-ray films are not helpful. We have a woman in her sixties with pain in the right foot of three months' duration and x-ray findings of a cystlike destructive lesion. Can this be a manifestation of some metabolic disease, such as parathyroidism? There is no other evidence for that. Just as a passing thought I shall mention gout. The x-ray films do not suggest it, and there were no tophi or other suggestive findings.

Could this be a syphilitic lesion? She is said to have had gonococcal ophthalmia. However, the patient denied venereal disease in its usual form, and the single blood Hinton test was reported to be negative. I believe that with a queer lesion of this sort, even with one negative Hinton test, we should continue to bear in mind syphilis as a possibility. Certainly the lesion is not characteristic.

Could this be a manifestation of sarcoid, with a lesion in the single bone? She is said to have had a negative chest plate.

Dr. Schatzki: The chest plate is negative for metastatic disease. There is evidence of old tuberculosis.

Dr. Wallace: That rules out sarcoid. Xanthoma is a possibility, but multiple bones are usually involved.

The pain followed by swelling is suggestive of fracture. There is no story of recent trauma but if there had been a fracture it would have been a pathologic fracture. I am not sure that we can rule it out even by looking at the x-ray films. A fracture might account for some of the new-bone formation.

She had a normal temperature and white-cell count; in addition, some serosanguineous fluid was aspirated that contained no organisms on smear or culture. We should be able to rule out osteomyelitis on the basis of these findings. There may have been metastatic disease in this area, but again that is unlikely. It would be difficult to explain the x-ray findings on the basis of metastatic disease alone, because in general such lesions show punched-out areas of destruction of bone without new-bone formation.

Could this have been due to a tumor of the lymphoma series? Since there is no mention of nodes in general, we must assume they were not large enough to have come to anyone's attention. In considering the lymphoma series our attention is called to the differential count, which had a high proportion of lymphocytes. That does not establish the diagnosis, however.

Could this have been a benign bone cyst not related to a general disease? They are usually solitary and are not of common occurrence in this location. The question of chondroma also comes up. The increased density, as Dr. Schatzki said, is suggestive of a localized chondroma. That appearance could also be caused by multiple chondromas.

With bone proliferation we should think of Ewing's sarcoma, although, of course, the x-ray picture is not characteristic. The localized areas of bone proliferation with ray formation are suggestive of osteogenic sarcoma. Only one small area, however, looks like the ray formation that we so frequently see.

There is considerable evidence that this patient has had and perhaps has active tuberculosis. There were definite x-ray signs of healed tuberculosis. The white-cell and differential counts were, I believe, consistent with that disease, and she had a markedly positive tuberculin test with a dilution of 1:1000. Tuberculosis of bone is generally a destructive lesion and usually has its origin in the region of the joints rather than in the shaft of the bone, as appears to be the case here; however, I do not believe that we can rule it out.

Since this lesion is characteristic of nothing and I must speculate about it, and since there is more

evidence for tuberculosis than for anything else, I shall make that diagnosis, with the reservation that it may have been one of a good number of lesions.

DR. TRACY B. MALLORY: Dr. Schatzki, would you like to express a further opinion?

DR. SCHATZKI: I remember that we were puzzled by the case. The ray formation was a little similar to what we had seen in low-grade infection. I do not remember what the final outcome was, so I am quite unbiased. I believe that the visible osteochondroma is significant and that the lesion turned out to be malignant tumor of bone, at least that is what I should call it now.

DR. CHANNING C. SIMMONS: Dr. Wallace has covered the possibilities well. In considering bone diseases, I like to divide them into four groups: generalized skeletal diseases, such as parathyroid disease and lymphoma; inflammatory diseases, such as syphilis, tuberculosis and osteomyelitis; primary bone tumors; and secondary or metastatic bone tumors.

Sarcoma is practically unknown in people over fifty, except in the presence of Paget's disease, and benign bone tumors are painless. Therefore I think primary bone tumors can be ruled out. A generalized skeletal disease can be excluded by the general examination. Metastatic tumors usually do not give this picture but can look like anything, just as lymphoma of the bone can simulate any other disease. My inclination is to consider this an inflammatory condition, possibly tuberculosis on the strength of the lung condition. The x-ray picture is not characteristic of any particular disease. The facts that she had pain and that fluid was obtained on tap, together with the high lymphocyte count, also suggest tuberculosis. One would have to repeat the blood Hinton test several times before syphilis could be excluded.

DR. MALLORY: Three opinions were expressed on the ward. Chronic osteomyelitis was put down as the first choice; the second was tuberculosis, and the third was bone tumor, type unclassified.

CLINICAL DIAGNOSIS

Chronic osteomyelitis.

DR. WALLACE'S DIAGNOSIS

Tuberculosis of metatarsal.

ANATOMICAL DIAGNOSIS

Chondrosarcoma of metatarsal.

PATHOLOGICAL DISCUSSION

DR. MALLORY: The lesion was explored, and a marked destructive process was found in the metatarsal. Some material was curetted out, which showed on frozen section a chondromatous structure. Following that, the entire metatarsal was removed. The final histologic diagnosis was low-grade chondrosarcoma of the metatarsal.

It is difficult to draw a dividing line microscopically between benign and malignant tumors of cartilage. Tumors that can behave in malignant fashion often look benign under the microscope. This one was sufficiently atypical so that I thought it had to be called malignant. Moreover, it had destroyed the cortex and we found some small masses of cartilaginous tissue in the soft parts around the bone.

The wound was closed, and the patient was allowed to go home. She is returning to the hospital from time to time for observation. As yet no one has seriously raised the question of amputation, although that is still under consideration.

DR. SCHATZKI: Was there any infection present? If not, the x-ray picture rules out benign tumor.

DR. MALLORY: The tumor had definitely destroyed the cortex.

DR. SIMMONS: I should rule out benign tumor on the mere fact that the patient had pain.

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RED CROSS MONTH

THE month's drive that the American Red Cross will open on March 1 may be hampered unless the public understands clearly how and why it is distinct from that of the United War Fund, particularly since the two were joined last year. The difference is essentially that between uniform and mufti. The Red Cross is primarily of and for the nation and its armed forces; the United War Fund is primarily of and for the community. The drives are alike in scope but differ in function. They are two horses pulling the same load, but they must be fed separately. This distinction has been emphasized by President Roosevelt in a letter to Norman Davis, national chairman of the American Red Cross, whose responsibilities, the President wrote, "will best be served if the Red Cross maintains direct contact with the people for the membership and support necessary for its work at home and abroad." By his direction, March is designated as "Red Cross Month." Thus, fittingly, the month of the God of War is dedicated to the Goddess of Mercy. Instant, universal and generous support of this campaign will guarantee the home support that our fighting men need so badly.

This campaign means lifesaving plasma to the soldier stopped by shrapnel and the sailor burned at his station on the gun deck. It means food and comfort to the prisoner of war. It means surgical dressings for the wounded. It puts the man overseas in direct touch with his home, and it assures him freedom from worry should disaster or affliction strike that home. Truly, it guides the Angel of Mercy to his side, in fox-hole or bomb-bay.

Red Cross Month imposes on every one of us an obligation that is a must, an opportunity to be greeted with joy. There were no deserters in Bataan. Let there be none in Massachusetts!

THE COMMONWEALTH FUND

WHEN an organization is founded to "do something for the welfare of mankind," its duty in a war for humanity is clear. The twenty-fourth annual report of the Commonwealth Fund, established for this purpose in 1918 by Mrs. Stephen V. Harkness, quotes its leaders as recognizing that "this is a technician's war, and the technics of medicine are essential to the winning of it." A third of the research undertakings aided by the Fund in 1942 had a bearing on specific issues of war medicine, notably the understanding and treatment of shock, the control of infectious diseases in the armed forces, and the problems of aviation medicine. The Fund contributed over $400,000 to war-relief and war-service agencies, among them the American Red Cross, the United China Relief, Incorporated, the American Field Service and the British War Relief Society. It also extended the work of the Child Guidance Council

in England, particularly through the latter's Mental Health Emergency Committee. Total disbursements for 1942 for all purposes totaled nearly $2,000,000.

The loss of key investigators, especially those engaged in clinical research, to the military and naval services has necessarily forced the curtailment or suspension of some projects, but the Commonwealth Fund has carried on with vigor its multifarious activities in medical education, rural hospitals and public health. A grant was made to the Long Island College of Medicine to pay for visiting instructors from other medical schools; ten fellowships for advanced study were awarded to junior instructors and staff members of medical schools and teaching hospitals. At several colleges the Fund subsidized special teaching units to acquaint pediatricians with the psychologic needs of sick children. Fifteen fellowships were offered to physicians and public-health workers from Latin American countries for postgraduate study in the United States. The outstanding research activities last year were related to respiration, renal function, the control of infectious diseases in armies, the epidemiology of poliomyelitis and the hereditary factors in the incidence of rheumatic fever.

The Commonwealth Fund has every reason to be proud of its solution of the problem of contributing fully to the war effort without the sacrifice of gains already made in nonmilitary fields. In short, it continues to carry forward, in war as in peace, the high purposes of its founder.

MEDICAL EPONYM

Stokes's Collar

William Stokes (1804–1878) first described this phenomenon in the *Dublin Journal of Medical and Chemical Sciences* (5:400–440, 1834), in an article entitled "Researches on the Diagnosis and Pathology of Aneurysm." He discusses a case of aneurysm of the aorta as follows:

> I was at once struck with the peculiar appearance of the neck. This was generally enlarged (giving the idea of the patient's wearing a collar or tippet), the jugular veins were turgid and tortuous.

He also mentions the phenomenon in the first part of *A Treatise on the Diagnosis and Treatment of Diseases of the Chest* (Dublin, 1837 — page 231) and again in *The Diseases of the Heart and the Aorta* (Dublin, 1854 — page 573), as follows:

> As an indication of intrathoracic tumor, an extremely varicose state of the superficial veins of the neck and thorax is probably less frequent in aneurismal than in cancerous diseases. The pressure may be exercised on the venae innominatae or the superior cava. . . . In other cases we find that in place of the large tortuous veins ramifying on the surface, there is a puffy elastic swelling of the entire neck. To this may be given the name of tippet-like swelling of the neck.

R. W. B.

RESOLUTION ON DEATH OF JOHN JOSEPH LUCY

Dr. John J. Lucy, late assistant visiting surgeon on the Second Surgical Service of the Boston City Hospital, died on December 28, 1942, in his forty-eighth year. He had been ill only about two months. He was born in Boston, and was graduated from Boston College and from Harvard Medical School. He took a surgical houseofficership at the Boston City Hospital, followed by a houseofficership at the Boston Lying-in Hospital. He was appointed to the Surgical Staff of the Boston City Hospital in 1925, having had the rank of assistant visiting surgeon for some years prior to his death. He was a member of the Surgical Staff of the Cambridge Hospital, being chief of one of the surgical services at that institution at the time of his death. He was a member of the American Medical Association, the Massachusetts Medical Society, the American College of Surgeons and the Boston Surgical Society, and for many years conducted a large private surgical practice.

He married Miss Alice L. McManus; this marriage was an exceedingly happy one, being blessed with seven children: four daughters and three sons, all of whom are living. In addition to his widow and children he is also survived by his mother.

Doctor Lucy was a man of real character, possessing the highest of principles, both professionally and personally. Loyalty was one of his outstanding qualities. In addition, he was endowed with a natural sympathy and understanding which endeared him to his fellow physicians, to his patients and to his friends. His loss to the profession and the community is indeed a great one.

Be It Resolved, That in the death of Doctor Lucy the Staff of the Boston City Hospital has lost one of its most capable and conscientious members; and

BE IT RESOLVED, That the Staff of the Boston City Hospital express its most sincere sympathy to the family of Doctor Lucy; and

BE IT FURTHER RESOLVED, That these resolutions be placed upon the records of the Boston City Hospital and that the secretary be directed to send a copy to the family of Doctor Lucy and a copy to the *New England Journal of Medicine*.

WILLIAM P. BOARDMAN, *Secretary*
Executive Committee, Senior Staff
Boston City Hospital

MASSACHUSETTS MEDICAL SOCIETY

COMMITTEE ON MATERNAL WELFARE

IMPRESSIONS CONCERNING THE MATERNAL MORTALITY STUDY FROM 1937 TO 1941

The maternal-mortality study that the Section of Obstetrics and Gynecology of the Massachusetts Medical Society has carried on for the State Department of Public Health has been concluded. In some respects it is the most laudable study of this kind that has ever been carried on in the United States.

Many inquiries have been made concerning how this study was conducted. The start is the death certificate, which is signed by the physician and gives the cause of death. In Massachusetts the certificate is then taken to the office of the board of health of the town or city in which the death occurred and is then recorded and filed by the town or city clerk. According to regulations, a copy of each certificate should be filed at the office of the Secretary of State by the tenth of the month following the death; however, in some communities where there are few deaths the copies of the certificates are sent to the State House only at infrequent intervals. Each certificate that reaches the office of the Secretary of State is reviewed by a lay person, and the necessary corrections are made. Before it is filed it is coded by a lay person according to the international classification of deaths, and all deaths occurring within ninety days of childbirth are automatically classified as maternal deaths. All such deaths are reviewed by an investigator from the Department of Public Health, who is a registered physician. He makes a copy of each certificate covering a maternal death on a questionnaire prepared by the Children's Bureau of the United States Department of Labor, the front page of which has a replica of the death certificate. During the period of study, copies of these questionnaires were sent to the committee of the Massachusetts Medical Society. The committee in turn forwarded them to members of the Society in different parts of the State who were doing obstetrics, so that personal interviews with the physicians signing the death certificates might be held. It was hoped that these questionnaires might reach the investigators within, at most, two months of the day of death so that the interviews might be held when the facts were fairly clear in the minds of the attending physicians. In many cases, however, it was impossible to have these deaths investigated as soon as it was hoped they could be. Some certificates were filed at the State House many months after the death. Often by the time the investigator approached the physician whose name was on the certificate, it was found that the physician had left to join the armed forces, so that a personal interview was impossible. Some of the investigators were so busy with their work and the work of others that months elapsed before investigations were started. After the cases had been investigated, the reports were returned to the committee and formed the basis for the figures that have appeared in the *Journal*.

The mechanism of the study was not perfect, but as has already been said, the results are probably as good, if not better, than those obtained in any part of this country. A much more ideal set-up would be to appoint an obstetrician, either a young or an older man with plenty of time on his hands, who could personally investigate each death, irrespective of in what part of the state it occurred, within two months of the date of the death. This investigator with a committee of five should go over the cases and allocate them to such headings as were agreed on by all. In the present study the allocation of the cause of death was done by one obstetrician. Had the cases been gone over by a committee it is quite possible that some of the doubtful cases would have been classified differently. If one man with plenty of time on his hands were to conduct such an investigation he could inquire into many details that were not taken into consideration in the present investigation. Frequently a record was not so valuable as it might have been because no mention was made of the duration of pregnancy. Often no mention was made whether a living child was obtained. Circumstances, perhaps beyond the control of anyone, frequently led to records that were lacking in essential information. Such an investigation as this is no stronger than its weakest link.

The study has brought out several facts that show the weakness of the system and the inaccuracy of the figures. So long as it is the policy to include every fatality occurring within ninety days of childbirth as a maternal death, these sta-

tistics, from the point of view of obstetrics, will obviously be misleading. They will show the actual number of mothers who died, but among that number will be many whose deaths had nothing to do with obstetrics. For the figures to mean what they should, patients who die within ninety days of childbirth and whose deaths are found to be nonobstetric should be eliminated. An example of this is a patient who died of asthma brought on by allergy to aspirin.

In Massachusetts, it is perfectly possible, although commonly unrecognized, to change the cause of death on the original certificate when it is proved to be untrue. This may be done by the physician who signed the certificate provided he is able to present proof of its inaccuracy. This flaw in the vital statistics applies to all branches of medicine and surgery. Not infrequently, a patient who dies in a hospital has as the cause of death on the certificate a diagnosis that has been proved by autopsy to be incorrect. If the institution in which this death occurred made application to the office of the Secretary of State, the incorrect certificate could easily be rectified. Such a routine procedure would make vital statistics in Massachusetts more accurate than they are at present. This can and should be done.

In this state, all sudden deaths and those with a questionable cause must be referred to the medical examiner before the body may be buried. Since the medical examiner in the course of a year sees a number of maternal deaths, by applying to the district attorney for permission to perform an autopsy in cases in which the exact cause of death is unknown, he would be able to make an exact anatomical diagnosis. If this were done more frequently than it is, the statistics would be improved.

Another cause of inaccuracy is the fact that an incorrect diagnosis is sometimes written on the death certificate. This is partly due to ignorance, and partly to sentiment. An embolus, in the lay mind, has long been looked on as an act of God. "Hemorrhage and shock" are not pleasant terms to convey to the stricken family. It is gratifying that fewer questionable causes of death were found as the study progressed.

It is not fair to attribute all the improvement in the rate of the maternal mortality in Massachusetts during the past five years to this study. Nevertheless, the study has brought obstetrics into the open, and has made physicians conscious that their work is under scrutiny. The diminution in the number of maternal deaths in which bungling obstetrics played a part shows either that physicians are more expert or that they are more careful. At the beginning of the study, some of the doctors resented an interview, since they believed that their privacy was being violated; this attitude no longer exists. Toward the end of the study, the co-operation between the general practitioner and the investigators was excellent. This study has also made the trustees of hospitals conscious of their responsibilities. They have at last learned to appreciate that their obligations to patients in hospitals extend to the medical care of those patients, and, in some instances, they have insisted that the practice of obstetrics should be supervised and that abnormal cases should be handled only by trained men. This achievement alone has made the study worth while.

The study has also brought out the fact that many women, either through ignorance or through stubbornness, do not receive adequate prenatal care. This is deplorable and warrants intensive educational propaganda.

In conclusion, the committee expresses its thanks for the co-operation that the physicians of Massachusetts have shown. It also expresses its deep appreciation for the willingness of those physicians who have served as investigators in these cases; the facts that they gathered, often under burdensome circumstances, have made the study possible.

* * *

The above paragraphs conclude the series of articles on the causes of maternal death that have been carried weekly in the *Journal* for the past four and a half months.

In the March 11 issue of the *Journal*, the Committee on Maternal Welfare will begin the presentation of a series of cases at two-week intervals. Half of these will concern instructive obstetric cases, and half will illustrate the proper handling of interesting and unusual neonatal cases.

DEATH

LEONARD — Edward J. Leonard, M.D., of Dorchester, died February 15. He was in his forty-second year.

A native of Dorchester, Dr. Leonard received his degree from Georgetown Medical School in 1936. He had an internship at Mercy Hospital, Baltimore. He served on the staffs of the Carney Hospital and St. Margaret's Hospital. He was a member of the Massachusetts Medical Society, the American Medical Association and the Dorchester Medical Society.

His widow, four children, two sisters and two brothers survive him.

WAR ACTIVITIES

CIVILIAN DEFENSE

Nursing Executives for Emergency Base Hospitals

To ensure adequate supervision of nursing service in emergency base hospitals, Surgeon General Parran of the United States Public Health Service has authorized the

appointment of a limited number of nurses with supervisory and administrative experience to serve as nursing executives, according to a recent announcement by the Medical Division of the United States Office of Civilian Defense.

Emergency base hospitals are institutions in relatively safe areas, adjacent to probable target areas, designated by the Medical Division to receive civilian casualties or other hospitalized persons from casualty receiving hospitals in the event of a grave wartime emergency.

The appointment of these nursing executives will follow in general the method that is being used in the appointment of physicians who, as members of affiliated hospital units, will hold inactive reserve commissions in the United States Public Health Service and will be called to active duty in emergency base hospitals only when additional staff is needed because of a war emergency.

Nurses recruited under this program may be assigned by the state chief of Emergency Medical Service to serve at emergency base hospitals either individually or with affiliated units. They may supervise a newly created nursing service or supplement the existing supervisory staff of an institution.

The nurses will be offered appointments in the United States Public Health Service as consultants on an inactive status and will be called to active duty by the Surgeon General on the recommendation of the state chiefs of Emergency Medical Service and regional medical officers only if their services are required at emergency base hospitals because of a military necessity, the circular states. When on duty they will be entitled to payment by the United States Public Health Service according to their experience and qualifications.

The circular authorizes the number of nurses to be recruited in each state for this purpose to be twice the number of affiliated hospital units actually being formed in the state. Although their appointments will obligate them to serve in an emergency base hospital in their regions if called to duty by the Surgeon General in a wartime emergency, they may resign their appointments at any time to accept assignments in the Army or Navy.

MISCELLANY

AMERICAN COLLEGE OF SURGEONS

New developments in military and civilian medical and hospital service will be brought to members of the medical profession at large and to hospital representatives through a series of twenty War Sessions, beginning March 1, to be held throughout the United States under the sponsorship of the American College of Surgeons with the co-operation of other medical organizations and of the Federal medical services.

Each session will consist of an all-day program, lasting from 9:00 a.m. to 10:00 p.m., including luncheon and dinner conferences. There will be eight meetings in each session, four of which will be for the entire assembly; the remainder will be divided into two meetings each for physicians and for hospital representatives. Subjects will be similar in each session but some of the speakers will be changed in the different states and service commands. Nationally known representatives of the United States Army, the United States Navy, the United States Office of Civilian Defense, the United States Procurement and Assignment Service and the United States Public Health Service will address the meetings and will lead the discussions, in addition to participation by prominent leaders in civilian medical practice and hospital service.

The topics relating to military medicine to be discussed will include care of the ill and injured in combat zones and after evacuation. The newer types of injuries encountered in this war, such as crush and blast injuries, will be especially considered, together with the prevention and treatment of infections, the treatment of burns and shock and the care of injuries of specific parts of the body. Anesthesia, plastic surgery and the psychoneuroses of war will be some of the other topics. The problems of civilian medical care in wartime will include the following: the responsibilities of individual physicians and hospitals; the personnel problems of hospitals; the organization of emergency medical services; the maintenance of adequate supplies, furnishings and equipment; the preservation of high standards of medical and nursing education and of hospital service in general; hospital public relations; and the necessary administrative adjustments in professional staffs of hospitals. The opening meeting of each session will be devoted to a discussion of the medical and surgical aspects of chemical warfare, led by a representative of the United States Office of Civilian Defense, and the closing meeting will be a panel discussion on problems in wartime civilian medical practice, led by representatives of the United States Public Health Service, the American College of Physicians, the American Medical Association, medical services in industry and the American College of Surgeons. Other topics for consideration at this meeting include endemic and epidemic diseases, medical services in industry, medical and surgical practice, and supplementary postgraduate education for medical officers and civilian physicians.

The schedule for the sessions is as follows:

	CITY	STATES AND PROVINCES	HEADQUARTERS
March 1	St. Paul	Minnesota, North Dakota, South Dakota	Lowry Hotel
" 3	Milwaukee	Wisconsin, Illinois	Schroeder Hotel
" 5	Indianapolis	Indiana, Kentucky, Ohio	Claypool Hotel
" 8	Detroit	Michigan	Statler Hotel
" 10	Pittsburgh	Pennsylvania, West Virginia	The William Penn
" 12	Buffalo	New York, Ontario	Statler Hotel
" 15	Boston	Massachusetts, Connecticut, Maine, New Hampshire, Rhode Island, Vermont	Statler Hotel
" 17	Brooklyn	New York City, Delaware, New Jersey	St. George Hotel
" 19	Richmond	Virginia, District of Columbia, Maryland	John Marshall Hotel
" 22	Charlotte	North Carolina, South Carolina	Charlotte Hotel
" 24	Birmingham	Alabama, Florida, Georgia	Tutwiler Hotel
" 26	Memphis	Tennessee, Arkansas, Mississippi	Peabody Hotel
" 29	Houston	Texas, Louisiana	Rice Hotel
April 1	Kansas City	Kansas, Missouri, Oklahoma	President Hotel
" 3	Omaha	Nebraska, Iowa	Fontenelle Hotel
" 6	Denver	Colorado, New Mexico, Wyoming	Cosmopolitan Hotel
" 9	Salt Lake City	Utah, Idaho	Utah Hotel
" 13	Los Angeles	Southern California, Arizona	Biltmore Hotel
" 16	San Francisco	Northern California, Nevada	Fairmont Hotel
" 20	Seattle	Washington, Montana, Oregon, British Columbia	Olympic Hotel

Dr. Irvin Abell, chairman of the Board of Regents of the American College of Surgeons, in announcing the War

Sessions, said that although participating states and provinces for each meeting have been designated to facilitate arrangements, there will be no geographic restriction on attendance, and those who plan to attend may select the place and time which are most convenient.

The American College of Surgeons canceled its 1942 national meeting and is holding in abeyance plans for a clinical congress in 1943. The regional meeting plan provided by the War Sessions is offered to save the time of physicians and other personnel, and to minimize transportation difficulties, without sacrificing unduly the educational and stimulative benefits of medical assemblies.

CORRESPONDENCE

NEED FOR MEDICAL OFFICERS

To the Editor: The need for physicians in the armed forces continues unabated. A large number must be made available from New England in the near future, and since the small communities have done more than their share, many of the future medical officers must come from metropolitan areas.

Physicians of the older age group — forty to fifty — have volunteered freely as have many younger men; yet there is a tendency for some of the latter to wait until called for.

The chief worry on the part of doctors volunteering for the Navy has been a financial one. Yet insufficient attention is paid to the fact that overhead and incidental expenses are immediately cut on entry into service to a degree that largely compensates for the loss of gross cash income received before. Furthermore, the Soldiers and Sailors Relief Act of 1940 protects an officer, his house and his family if he can show that his net income has been substantially reduced.

It is also frequently said that physicians well trained in one field are assigned to duties for which they are ill fitted or which are beneath their professional ability. Although instances of this character do exist, it must be recognized that the exigencies of war may in certain cases render such waste temporarily necessary and, further and more important, that every effort is made to allocate a man to that position for which he is best fitted. This is the definite, stated policy of the Surgeon General, and it is followed so far as is humanly possible.

The further objection has been raised that often for many months a previously busy physician is comparatively inactive after having been commissioned. Such boresome waiting stems in part from the necessary and vital indoctrination of the Navy and in part from the difficult problem of proper allocation of the individual. Line officers and enlisted men are equally confronted with the same problem.

I urge every physician of military age to volunteer for the Army or the Navy. Whether he is or is not truly essential in civil life can and should be objectively decided by the Procurement and Assignment Service. Those who volunteer will indicate their loyalty to their country and their faith in their fighting comrades.

Applications of interns and residents may be accepted before clearance by the Procurement and Assignment Service if availability is anticipated within twelve months.

If any physician cares to discuss matters concerning his opportunities in the United States Naval Reserve, I shall be pleased to consult with him any day except Sunday between the hours of 8:00 a.m. and 3:30 p.m.

R. S. Palmer
Commander, MC-V(S), U.S.N.R.
Senior Medical Officer
Office of Naval Officer Procurement
150 Causeway Street
Boston

VERSION EXTRAORDINARY

To the Editor: The following quotation is from Herman Melville's *Moby Dick*, a work especially dear to those New Englanders who were born close to salt water. In the annals of obstetrics this case is surely one of the most remarkable.

Queequeg has just delivered Tashtego from the head of the sperm whale. The quotation follows:

> "Both! both! — It is both!" — cried Daggoo again with a joyful shout; and soon after, Queequeg was seen boldly striking out with one hand, and with the other clutching the long hair of the Indian. Drawn into the waiting boat, they were quickly brought to the deck; but Tashtego was long in coming to, and Queequeg did not look very brisk.
>
> Now, how had this noble rescue been accomplished? Why, diving after the slowly descending head, Queequeg with his keen sword had made side lunges near its bottom, so as to scuttle a large hole there; then dropping his sword, had thrust his long arm far inwards and upwards, and so hauled out our poor Tash by the head. He averred, that upon first thrusting in for him, a leg was presented; but well knowing that that was not as it ought to be, and might occasion great trouble; — he had thrust back the leg, and by a dextrous heave and toss, had wrought a somerset upon the Indian; so that with the next trial, he came forth in the good old way — head foremost. . . .
>
> And thus, through the courage and great skill in obstetrics of Queequeg, the deliverance, or rather delivery of Tashtego was successfully accomplished, in the teeth, too, of the most untoward and apparently hopeless impediments; which is a lesson by no means to be forgotten. Midwifery should be taught in the same course with fencing and boxing, riding and rowing.

Wm. Pearce Coues, M.D.
87 St. Mary's Street
Brookline, Massachusetts

NURSES FOR THE ARMED FORCES

To the Editor: The careful analysis of the nursing situation by Dr. Robert T. Monroe, as reported in the January 14 issue of the *Journal*, merits the attention of every physician. The fact of the matter is that we are in a serious predicament and none of the solutions suggested sounds hopeful to me.

We have been altogether too easy in allowing without protest the loss of so many nurses. For after all the greatest amount of illness is not among the armed forces, but right here at home. In fact if the home front is not adequately protected by both doctors and nurses, our output of war materials will be seriously curtailed. With the flight of the practical nurse to more lucrative fields in industrial plants, we cannot afford further weakening of our nursing service, despite the demands of the armed

forces. My solution is that enlisted men be trained as nurses by a short intensive course, which will equip them quite as well for nursing as the pharmacist's mate is equipped to take over the medical and surgical care of the men on ships where there are no medical officers. To get this practical and feasible suggestion into actual execution will require considerable effort because of the rigid mental processes of the military. But the civilian has had to change his whole scheme of living, and there is no reason why the military powers-that-be should not cut the pattern according to the cloth. For even though there are ten million men in the armed forces, there are one hundred and twenty million civilians at home.

EOLINE C. DUBOIS, M.D.

174 Buckingham Street
Springfield, Massachusetts

BOOK REVIEWS

Surgery of Modern Warfare. By sixty-five contributors. Edited by Hamilton Bailey, F.R.C.S. In two volumes. Vol. II. 4°, cloth, 899 pp., with 325 illustrations. Baltimore: The Williams and Wilkins Company, 1941. $10.00.

This volume is a continuation of the first o..., which has already been reviewed in this column. The general principles of war surgery, with some special sections, were discussed in the first volume. The second volume completes the work on fractures and amputations and considers war surgery of the head, neck and brain.

The material presented has obviously not been written for the specialist in the base hospital, but rather for the officer who starts the patient on his way back from the front. Without a knowledge of what must and can be done in particular cases, it is often difficult for the front-line medical man to make decisions regarding individual cases.

The material included is so varied and extensive that one hesitates to single out any parts for mention. The best of civilian surgery has been taken by a group of experts and adapted to war conditions as their own experience dictates. The chapters on organization of medical service close to the front are fully as important as the rest of the two volumes, for the quality of surgery in war depends greatly on having the man who knows in the right place.

Electrotherapy and Light Therapy, with the Essentials of Hydrotherapy and Mechanotherapy. By Richard Kovacs, M.D. Fourth edition. 8°, cloth, 735 pp., with 314 illustrations and 1 color plate. Philadelphia: Lea and Febiger, 1942. $8.00.

Seventy-four illustrations were eliminated from the fourth edition of this book on the ground that they were obsolete. For the same reason, similar treatment should have been accorded to the title of the book. "Physical therapy" is a more comprehensive term and one more commonly used for texts of the category to which this treatise belongs. Such a change became even more appropriate when the extra chapters on hydrotherapy, massage and exercises were added, none of which belong to the realm of electrotherapy and light therapy.

The text itself is justly deserving of the popularity that it is apparently enjoying. This is manifested by the fact that within ten years it has run through four editions. Such accomplishment has been made possible by the author's constant vigilance for every form of progress made in this field. Another factor contributing to the value of this book is the fact that Dr. Kovacs enlisted the aid of several competent men to collaborate with him — each one in his particular field. The result is a comprehensive and an authoritative textbook on physical therapy.

On the whole, good judgment was used in rearranging the material, eliminating some illustrations and diagrams and adding new ones. This is particularly true in the section dealing with short-wave and long-wave diathermy, particularly regarding the underlying theories of electrophysics. The latter is a subject that is confusing and annoying to many an earnest physician who dislikes empiricism. Much more light is needed to clarify short-wave currents — a relatively new physical agent.

Not all changes, however, have been for the better. Thus, the glossary in the preceding editions, which occupied fifteen pages, was a valuable source of information. The reason for its omission from the present edition, which is nine pages shorter than its predecessor, is not evident. Its restoration in future editions will be welcome.

Vaginal Hysterectomy. By James W. Kennedy, M.D., and Archibald D. Campbell, M.D.C.M., F.R.C.S. (Can.), F.R.C.O.G. 4°, cloth, 495 pp., with 44 illustrations. Philadelphia: F. A. Davis Company, 1942. $10.00.

This book is written by two authors, both of whom use vaginal hysterectomy extensively. The senior author, Dr. Kennedy, is an extremist and enthusiast who is almost on a crusade for vaginal hysterectomy. Dr. Campbell begins his part with a discussion of the anatomy of the female pelvis, and limits his indications to those patients who have a damaged birth canal and need hysterectomy. The authors state that they do not consider vaginal hysterectomy a substitute for abdominal hysterectomy in all cases, but they do emphasize most properly that this procedure has fallen into disrepute in many places simply because a teacher has condemned it through a lack of experience with it. To quote: "We have preceded the general discussion of vaginal hysterectomy by the above admonitions for the reason that we know of no subject in major surgery about which so many ignorant and ignoble statements have been made by teachers as that concerning vaginal hysterectomy."

The indications for this operation that are enumerated by the senior author are without question proper in his hands. However, in the opinion of the reviewer, the use of a surgical procedure must be governed by the ability and training of the surgeon. If one begins to master hysterectomy via the vaginal route by first applying it in prolapse and procidentia, then one may in time so perfect his technic that the operation may be safely used to remove the fibroid uterus. In such matters each surgeon must be the judge of his own limitations and no rules can be stated for his conduct. One can say categorically that various procedures give the same end result in the hands of different operators, for example, the operations for prostatectomy. The lesson of his work is that vaginal hysterectomy should have a place in the repertoire of all those who treat gynecologic patients, and when one becomes expert at it, its indications may be extensive.

There are excellent illustrations of both the clamp and suture methods, and all details of technic are clearly presented. This is a book that should be the library of all who do gynecologic surgery.

NOTICES

GREATER BOSTON MEDICAL SOCIETY

A meeting of the Greater Boston Medical Society will be held in the auditorium of the Beth Israel Hospital on Tuesday, March 2, at 8:15 p.m. There will be a symposium on burns followed by a discussion.

PROGRAM

Treatment of Shock. Dr. David D. Berlin.
Loss of Plasma. Dr. Stanley Levenson.
Treatment of the Surface. Dr. G. H. A. Clowes, Jr.
Chemical Disturbances. Dr. F. H. L. Taylor.
Pulmonary Injury. Dr. Maxwell Finland.
Destruction of Red Blood Cells. Dr. T. H. Ham and Dr. S. C. Shen.
Some General Considerations. Dr. Charles C. Lund.

EDWARD K. DUNHAM LECTURES

The Faculty of Medicine of Harvard University has announced that the following lectures on "The Human Response to Flying Stress" will be delivered by Dr. Charles Putnam Symonds under the Edward K. Dunham Lectureship for the Promotion of the Medical Sciences:

Wednesday, March 10. "The Two Sides of the Problem."
Thursday, March 11. "The Foundations of Confidence."
Friday, March 12. "Aircrew Selection and Maintenance."

These lectures are scheduled for 5 p.m. at the Harvard Medical School, Building C Amphitheater.

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Lecture Hall, 9–10 a.m.

MEDICAL CONFERENCE PROGRAM

Wednesday, March 3 — Inhalational Therapy in Serious Respiratory Disease. Dr. Maurice S. Segal.

Friday, March 5 — Chronic Seasickness. Lt. Comdr. Robert S. Schwab.

Wednesday, March 10 — Presentation of Unusual Cases from the Medical Clinic. Dr. H. G. Brugsch.

Friday, March 12 — Certain Aspects of the Role of the Adrenal Cortex in Anoxia. Dr. Marshall Clinton, Jr.

Wednesday, March 17 — The Clinical Significance of the Administration of Amino Acids for the Maintenance of Nitrogen Equilibrium. Dr. Paul Hecht.

Friday, March 19 — Gastrointestinal Hemorrhage. Dr. Fernando Biguria.

Wednesday, March 24 — Dietary Outlines for Vitamin Deficiency Diseases. Miss Frances Stern.

Friday, March 26 — Late Advances in the Control of Gonorrhea. Dr. Oscar F. Cox.

Wednesday, March 31 — Weil's Disease. Dr. Francis E. Bruno.

On Tuesday and Thursday mornings Dr. S. J. Thannhauser will give medical clinics on hospital cases.

(Notices continued on page xi)

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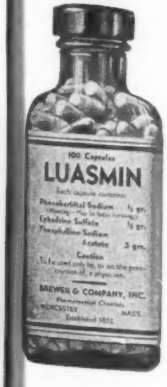

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*A New Type of Medication to Be Used in Bronchial Asthma and Other Allergic Conditions. *New England Journal of Medicine* 223:843–846, 1940.

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ROBERT N. NYE, M.D., *Managing Editor.*

*Not subject to discount.
†Approximately 5 words to a line.

BOSTON GASTROENTEROLOGICAL SOCIETY

The next meeting of the Boston Gastroenterological Society will be held in the Dowling Amphitheater of the Boston City Hospital on Wednesday, March 10, at 12:00 m. Dr. Frank H. Lahey will discuss "Surgical Problems of the Large Bowel."

JOHN T. BOTTOMLEY SOCIETY

The regular monthly meeting of the John T. Bottomley Society will be held in the Out-Patient Department Building of the Carney Hospital on Tuesday, March 2, at 11:30 a.m. There will be a symposium on gall-bladder disease as follows:

Medical Aspects. Dr. Francis J. West.
X-ray Aspects. Dr. Alfred J. Leary.
Common-Duct Disorders. Dr. William F. Flynn.
The Acute Gall Bladder. Dr. Timothy F. P. Lyons.

Physicians and students are cordially invited to attend.

ASSOCIATION FOR THE STUDY OF INTERNAL SECRETIONS

Upon advice of the Office of Defense Transportation, the meeting of the Association for the Study of Internal Secretions tentatively scheduled for April 5 and 6 at Cleveland, Ohio, is indefinitely postponed.

SOCIETY MEETINGS AND CONFERENCES

CALENDAR OF BOSTON DISTRICT FOR THE WEEK BEGINNING SUNDAY, FEBRUARY 28

SUNDAY, FEBRUARY 28

†4:00 p.m. Healthy Children. Dr. Allan M. Butler. Amphitheater of the Peter Bent Brigham Hospital.

MONDAY, MARCH 1

*12:15–1:15 p.m. Clinicopathological conference. Peter Bent Brigham Hospital amphitheater.

TUESDAY, MARCH 2

*9:00–10:00 a.m. Medical clinic. Dr. S. J. Thannhauser. Joseph H. Pratt Diagnostic Hospital.

*11:30 a.m. John T. Bottomley Society. Carney Hospital. Out-Patient Department Building.

*12:15–1:15 p.m. Clinicopathological conference. Peter Bent Brigham Hospital amphitheater.

8:15 p.m. Greater Boston Medical Society. Beth Israel Hospital.

WEDNESDAY, MARCH 3

*9:00–10:00 a.m. Inhalation Therapy in Serious Respiratory Disease. Dr. Maurice S. Segal. Joseph H. Pratt Diagnostic Hospital.

*12:00 m. Clinicopathological conference. Children's Hospital.

THURSDAY, MARCH 4

*9:00–10:00 a.m. Medical clinic. Dr. S. J. Thannhauser. Joseph H. Pratt Diagnostic Hospital.

7:15 p.m. New England Hospital for Women and Children. Monthly clinical conference and meeting of the staff.

FRIDAY, MARCH 5

*9:00–10:00 a.m. Chronic Seasickness. Lt. Comdr. Robert S. Schwab. Joseph H. Pratt Diagnostic Hospital.

(Notices continued on page xiii)

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SATURDAY, MARCH 6

*10:00–11:30 a.m. Medical staff rounds. **Peter Bent Brigham Hospital.**

*Open to the medical profession.

†Open to the public.

MARCH 3–31. Joseph H. Pratt Diagnostic Hospital. Medical conference program. Page ix.

MARCH 9. New England Society of Anesthesiology. Page xiii, issue of February 18.

MARCH 10. Boston Gastroenterological Society. Page xi.

MARCH 10–12. Edward K. Dunham Lectures. Page ix.

APRIL 5 and 6. Association for the Study of Internal Secretions. Page xi.

DISTRICT SOCIETIES

BRISTOL SOUTH

MAY 6. New Bedford.

ESSEX NORTH

MAY 5.

ESSEX SOUTH

MARCH 3. Essex Sanatorium.
APRIL 7. Addison Gilbert Hospital, Gloucester.
MAY 5. Salem Country Club.

FRANKLIN

MARCH 9.

MAY 11. Annual meeting.
Meetings are held at 11:00 a.m. at the Franklin County Hospital, Greenfield.

HAMPSHIRE

MARCH 3.
MAY 5.

MIDDLESEX EAST

MARCH 17. Bear Hill Golf Club, Stoneham, 12:15 p.m.
MAY 5. Bear Hill Golf Club, Stoneham, 6:30 p.m.

MIDDLESEX NORTH

APRIL 28.
JULY 28.

PLYMOUTH

MARCH 18. Goddard Hospital.
APRIL 15. Bridgewater State Farm.
MAY 20. Lakeville.

WORCESTER

MARCH 10. Memorial Hospital, Worcester.
APRIL 4. Hahnemann Hospital, Worcester.
MAY 12. Annual meeting.

WORCESTER NORTH

APRIL 28.
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